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TWENTY-SIXTH VOLUME.

FROM JANUARY TO DECEMBER, 1895, INCLUSIVE.

NATIONAL CAR AND LOCOMOTIVE BUILDER

DEVOTED TO THE INTERESTS OF RAILWAY ROLLING STOCK.

R. M. VAN ARSDALE, Proprietor.

GEORGE H BAKER, Editor.

PUBLICATION OFFICE:

MORSE BUILDING, NEW YORK.

68124

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NATIONAL CAR AND LOCOMOTIVE BUILDER

JANUARY, 1895.

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The Atlantic Coast Line is about to order 250 freight cars.

The Washington Coal Company is about to order 300 coal cars.

The Buffalo, Rochester & Pittsburgh is about to order 250 box cars.

The Wheeling & Lake Erie road is about to order 12 passenger cars.

The Fitchburg Railroad is building in its own shops 24 new passenger cars.

The Queen & Crescent will soon order about 250 freight cars to fill vacant numbers.

The Gaskins Non-Friction Car-Coupler Company has been incorporated at Arcadia, Fla.

The South Baltimore Car Works will rebuild 800 freight cars for the Baltimore & Ohio.

The Southern Pacific is about to order a large number (1,000 or 1,500) of new freight cars.

The Rogers Locomotive Works are building four locomotives for the Toledo, Peoria & Western.

The Fitchburg Railroad has ordered five mogul locomotives of the Schnectady Locomotive Works.

A number of new flat cars are being built at the Columbus, O., shops of the Pennsylvania Railroad.

The Cincinnati, Hamilton & Dayton has ordered three locomotives of the Pittsburgh Locomotive Works.

The headquarters of the American Railway Union have been moved from Chicago to Terre Haute, Ind.

The Bass Car Wheel Works, at Lenoir City, Tenn., have been completed, and will begin to make castings at once.

The St. Paul & Duluth will soon order about five passenger cars to replace those burned in the great forest fire last September.

The Memphis Car and Foundry Company, of Memphis, Tenn., is rebuilding a number of cars for the Kansas City, Ft. Scott & Memphis.

The Pennsylvania Railroad has put in service on its Middle division five new Class R freight locomotives recently built at Altoona.

Machine and repair shops, to cost $30,000, will be established at Shreveport by the Kansas City, Shreveport & Gulf Railway.

Nine passenger conductors of the West Shore Railroad have been discharged for passing people over the road and taking and pocketing money for it.

The Leslie Manufacturing Company, of Paterson, N. J., has recently shipped to California a new rotary snow plow built for the Southern Pacific.

A Baltimore street car company is considering the construction of a hearse on car trucks, with one story for the coffin and another for the mourners.

Two schoolboys of Peabody, Mass., tried to wreck a Portland & Maine passenger train recently in order to kill a lady teacher who had whipped them.

Four masked men boarded a Chicago, Milwaukee & St. Paul passenger train at Sioux City, Ia., Dec. 22, and relieved the passengers of their surplus wealth.

It is announced that the Missouri, Kansas & Texas will order 2,000 new freight cars in January. These are to be 500 coal cars, 700 furniture cars and 800 box cars.

The Pennsylvania Railroad is contemplating the construction of a large number of new cars, part of which will probably be let to private car building companies.

Alva Johnson pleaded guilty at Los Angeles, Cal., Dec. 15 to participation in the Southern Pacific train robbery at Roscoe, and was sentenced to the penitentiary for life.

The Columbus, Hocking Valley & Toledo Railroad has ordered 1,000 cars of the Michigan Peninsular Car Company. It is said that but 100 of these will be built at present.

The South Carolinia & Georgia Railroad has ordered 250 fruit cars of the Mt. Vernon Car Company, of Mt. Vernon, Ill. This company now has orders on hand for over 500 cars.

The White Locomotive Works have been incorporated in West Virginia with a capital stock of $2,000,000. The plans of the company or the names of the officers have not been announced.

The Ryan & McDonald Construction Company, whose Works are at Curtis Bay, South Baltimore, is building 50 freight cars for the Mineral Railroad and Terminal Company, of Monterey, Mexico.

The New York & New England Railroad needs 750 new box-cars and 450 new coal cars, and it is expected that these will be ordered as soon as the Reorganization Committee passes on the matter.

The Oregon Pacific Railway was sold Dec. 22 under the foreclosure of a mortgage to Bonner & Hammond, of Missoula, Mont., for $100,000. The road is 147 miles long and cost $11,000,000 to build.

The *Railway World* announces that "the Water Locomotive Construction Company, of Rutland, Vt., has been organized, with $1,000,000 capital stock, to manufacture, operate, and lease water locomotives under certain patents."

A brakeman on the New York & New England road was killed in a curious way during a recent break-in-two collision. He was on a box-car loaded with ice. The car roof opened and he fell in and was crushed between the blocks of ice.

A New York, New Haven & Hartford engineer leaped from his engine while passing through Milford, Conn., on the night of Dec. 16 and was badly hurt. He thought he was going to have a rear end collision, but what he saw was the rear lights of a train on a parallel track.

The New York, New Haven & Hartford has just placed orders with the Bradley Car Works, of Worcester, Mass., and the Keith Manufacturing Company, for 100 box and 100 coal cars. This is said to be the largest order ever placed by the Consolidated with outside car builders.

The Lenoir Car Company's new plant at Lenoir, N. C., has started up on an order for 400 hopper-bottom coal cars for the Southern Railway, and 100 cars for the Knoxville & Ohio Railroad. The officers of the company are W. P. Chamberlain, President, and R. Z. Roberts, Vice-President and General Manager.

The Union Car Company, of Depew, N. Y., is building 30 flat cars for the Toronto, Hamilton & Buffalo, 20 platform cars and a snow plow for the Buffalo & Susquehanna, and a snow plow for the Buffalo, Bellevue & Lancaster road. The company is also rebuilding a number of cars for private lines.

Charles Jones, the last survivor of the gang of train robbers that held np the Northern Pacific express near Billings, on Aug. 25, 1893, was sentenced in the United States Court at Helena, Mont., Dec. 22, to 10 years' imprisonment. He was one of four that comprised the gang. The others were all killed in capture.

A statement prepared by Mr. Samuel Spencer, President of the Southern Railway, shows that the system (4,404 miles) has earned in the first four months of the current fiscal year, gross, $6,149,247, an increase of $329,334, and net, $1,936,887, an increase of $186,272, compared with the earnings last year of the railroads comprising the system.

In the United States Senate, on Dec. 22, Senator Sherman, of Ohio, offered an amendment to the Railroad Pooling Bill, which requires sleeping-car companies to provide a safe for the protection and care of all valuables carried by passengers without charge to them. The bill also limits the charges of sleeping-cars to not more than half-a-cent a mile for the use of a lower and one-third of a cent a mile for the use of an upper berth, nor more than half-a-cent a mile for the use of a seat in parlor or drawing-room cars. Suitable punishments for offences committed in violation of the act are provided.

The West Shore fast National Limited train, leaving New York at 7:35 p. m., arriving at Buffalo at 7:40 a. m., in addition to the high-class sleeping-car accommodations, has attached a modern first-class coach for the accommodation of passengers who are going to points at which this train is scheduled to stop, but do not desire to occupy sleeping-cars.

Improvements in the design and construction of journals and bearings, and in their lubrication, are reducing the old time "hot box" nuisance to a minimum. Recently a traveler who made a trip of 10,000 miles, which included points as far apart as the City of Mexico, San Francisco and Chicago, said he did not encounter a hot box until he was within 20 miles of New York on his return.

The New York & Florida special, which has been a feature of Southern travel for several years, will be put in service again this season over the Atlantic Coast Line, the first train running on Monday, Jan. 7. It will leave New York daily, except Sunday, at 4:30 o'clock, p. m. and Washington at 10:48, arriving at Jacksonville the next evening at 7:05 o'clock, and at St. Augustine at 8:15.

The mechanical department of the Baltimore & Ohio Railroad is experimenting with crushed coke as a fuel for passenger engines to obviate the smoke nuisance. The only alteration found necessary to burn coke is to change from the plain bar grate to the finger grate, giving a larger area of opening, and the introduction of some air-holes through the firebox above the surface of the fire.

A dispatch from San Francisco announces that the Southern Pacific Company, which has been retrenching by combining divisions and consolidating departments, will start the new year with slashing cuts in wages of many employees. The cut will fall most heavily on locomotive engineers, many of whom on the mountain divisions are making $200 a month. These will be reduced 33 per cent., while the switch engineers will be cut 22 per cent. Freight handlers will be cut 10 per cent. Conductors and brakemen will not have their wages reduced, but they will be compelled to make longer runs, which will cause many dismissals.

The unemployed workmen in the vicinity of Pullman, Ill., have petitioned the State officers for help. The vice-chairman of the old Pullman Strike Committee declares that something must be done at once to alleviate the sufferings of people in the Pullman, Roseland and Kensington districts who are without employment. He said: "There are 1,000 families in that locality who do not know which way to turn for the morrow's support. About 50 per cent. only are those who suffered as a direct result of the strike at Pullman. The scheme of the Pullmanites to emigrate to Hiawatha, Kan., is progressing slowly, while the Mobile, Ala., scheme has also proved a failure."

"Christmas-trees" add considerably to traffic, State and interstate, about Christmas-time. The demand for these delights for the small folk requires thousands of carloads of the "trees." About 125 carloads are needed every year for New York city alone. About two-thirds of the entire supply comes from Maine, and most of the rest from the Catskill and Adirondack mountains. These are shipped broadcast over the country, especially to the Eastern, Middle and Southern States, and even to South America. Each carload consists of from 600 to 700 bunches each, containing from two to six trees, according to the size of the latter. Trees ranging from 18 to 25 feet in height, for churches, etc., come singly and each counts as a bunch.

In our last issue we announced that the freight business on the New York, New Haven & Hartford was so great that enough engines could not be had to do the work, and that passenger engines were being pressed into freight service. The company has now sought relief by ordering 25 new consolidation locomotives of the Rhode Island Locomotive Works. They will have four pairs of coupled driving wheels 51 inches in diameter. The cylinders will be 21 inches by 26 inches, and the boiler of each will be 72 inches in diameter. The engines will weight 150,000 pounds, 138,000 pounds of which will rest on the drivers. Their construction is to be rushed. They are to be built according to drawings and specifications furnished by Mr. John Henry, Jr.

The New York & Brooklyn Bridge cable railroad uses seven switch engines at the bridge terminals to handle the trains of cable cars, which vary between two and four cars according to the demands of travel at different hours of the day. The seventh engine is one that was put in service last spring, and is more powerful than the others, these having cylinders 12 inches by 16 inches, and the new engine having cylinders 14 inches by 18 inches. The new engine has four coupled driving wheels 42 inches in diameter, with a pair of supporting wheels at front and rear. It weighs 68,000 pounds, 80 per cent. of which rests on the drivers. The driving-wheel base is five feet, and the boiler carries 160 pounds steam pressure. The drivers are four inches larger, the driving wheel base one foot shorter, and the steam pressure 10 pounds greater than with the old engines. A saddle tank on the boiler holds 750 gallons of water. This engine has proved so satisfactory that two similar ones have now been ordered of H. K. Porter & Co. for $4,746 each. About the only change made is in the tank, which in the new engines will hold 1,000 gallons of water.

Master Mechanics' Association Circulars.

Causes of Bulging of Firebox Sheets.

The circular of inquiry prepared by this committee was published on page 187 of our December issue. Since its publication the committee has added four more questions to the circular, as follows :

Do you consider that the fact that the inside of the sheet is hotter than that next to the water has any influence on the bulging of sheets? If so, can you suggest a practical remedy?

Does the spacing of staybolts have anything to do with the bulging of sheets? Do you consider that closer spacing would provide a partial remedy?

Have you noticed that the use of oil in boilers to neutralize the evil effects of bad water has had a tendency to increase the bulging of sheets? In stationary boilers there has been an insoluble soap formed by oil and water impurities deposited on furnace sheets which caused overheating. Has anything of this character been noticeable by you in locomotive boilers?

Have you any reason to believe that the variation of temperature between the outside and inside of sheets has had anything to do with the breaking of staybolts?

The committee consists of Messrs. P. LEEDS, JOHN HICKEY, JOHN ELLIS, A. E. MANCHESTER and GEORGE. H. BAKER.

Answers to be sent to P. Leeds, Superintendent Machinery, Louisville & Nashville Railroad, Louisville, Ky.

Best Material for Boiler Tubes.

Your Committee on Best Material for Boiler Tubes and specifications for same desires a full expression of opinion on this subject. Will you please, therefore, answer the following questions?

1. What is the best material for locomotive tubes?
2. Please give your reasons for this preference.
3. In ordering tubes do you furnish specifications? If so, please send a copy of same.
4. In your opinion would a tube made of a *fair quality* of material, combined with a safe end made of a *good quality* of material, answer for all practical purposes?
5. What is the maximum length of locomotive tubes of different diameters?
6. What should be the thickness of metal for tubes of different diameters?
7. How often may tubes be pieced out with advantage and safety?
8. When and for what causes should tubes be condemned?
9. How do you test tubes and safe ends?
10. In making specifications for tubes, is the effect on them of the water used taken into consideration?
11. Describe your method of fastening tubes at front and back end, say whether copper ferrules, and what kind of tools are used for caulking and turning over the ends of tubes.

Members are requested to furnish any additional information, not covered by the questions, on this important subject. Please answer these questions and mail same before Jan. 15, 1895, to T. A. Lawes, Mechanical Engineer, C., C., C. & St. L. Ry., Indianapolis, Ind.

T. A. LAWES, W. L. GILMORE, R. B. REDDING, P. H. PECK, M. N. FORNEY, Committee.

Riveted Joints.

The committee appointed to submit a set of proportions for riveted joints representing the most approved practice has issued the following circular :

To Members of the Association:

Your Committee on Riveted Joints desires information as to your practice and experience on the following points:

The information furnished should apply only to your latest practice and should not include data relative to old styles and types of joints used by you in the past unless such joints represent your present practice.

To facilitate the work and make it more convenient for the committee, please embrace the information called for in the first ten items on a drawing or tracing 8¼ by 10¾ inches in size, showing only one joint on each drawing or tracing; all joints used should be furnished and every drawing should be fully dimensioned.

A sufficient amount of each joint should be shown to enable a calculation to be made of its efficiency; hence please show not less than three rivets of the row with greatest pitch.

1. Thickness of stock plates or sheets.
2. Thickness of inside butt or welt strips.
3. Width of inside butt or welt strips.
4. Thickness of outside butt or welt strips.
5. Width of outside butt or welt strips.
6. Diameter of rivet or rivets.
7. Diameter of rivet hole or holes.
8. Distance from edge of stock and welt sheets to center of first row of rivets.
9. Distance between each row of rivets.
10. Distance (pitch) between each rivet on each row.
11. Are rivet holes punched or drilled?
12. If sheet is punched or drilled, do you remove the burr from the edge of the hole before assembling the sheets?
13. Do you ream the rivet holes after assembling the various sheets?
14. In punching your sheets do you punch them so that the smaller diameter of the holes will be together when assembled, or *vice versa*?
15. Do you use iron or steel rivets?
16. Do you single or double rivet the mud ring?
17. Do you consider it advisable to double rivet the circumferential seams of a locomotive boiler? If so, why?
18. Have you ever seen the joints in a firebox double riveted?
19. Have you ever made any physical tests of riveted joints? If so, please give us the results obtained and how closely the results compared with the calculated strength.

The Committee would also be pleased to receive information relative to your practice in riveting domes, mud rings, boiler heads, fire door and other sheets in a boiler, and your reasons for adopting such practice.

In order that the Committee may have ample time to compile and work up its report, kindly have all replies forwarded *not later than Feb.* 15, to A. E. Mitchell, Superintendent M. P., N. Y., L. E. & W. R. R., 21 Cortlandt street, New York City.

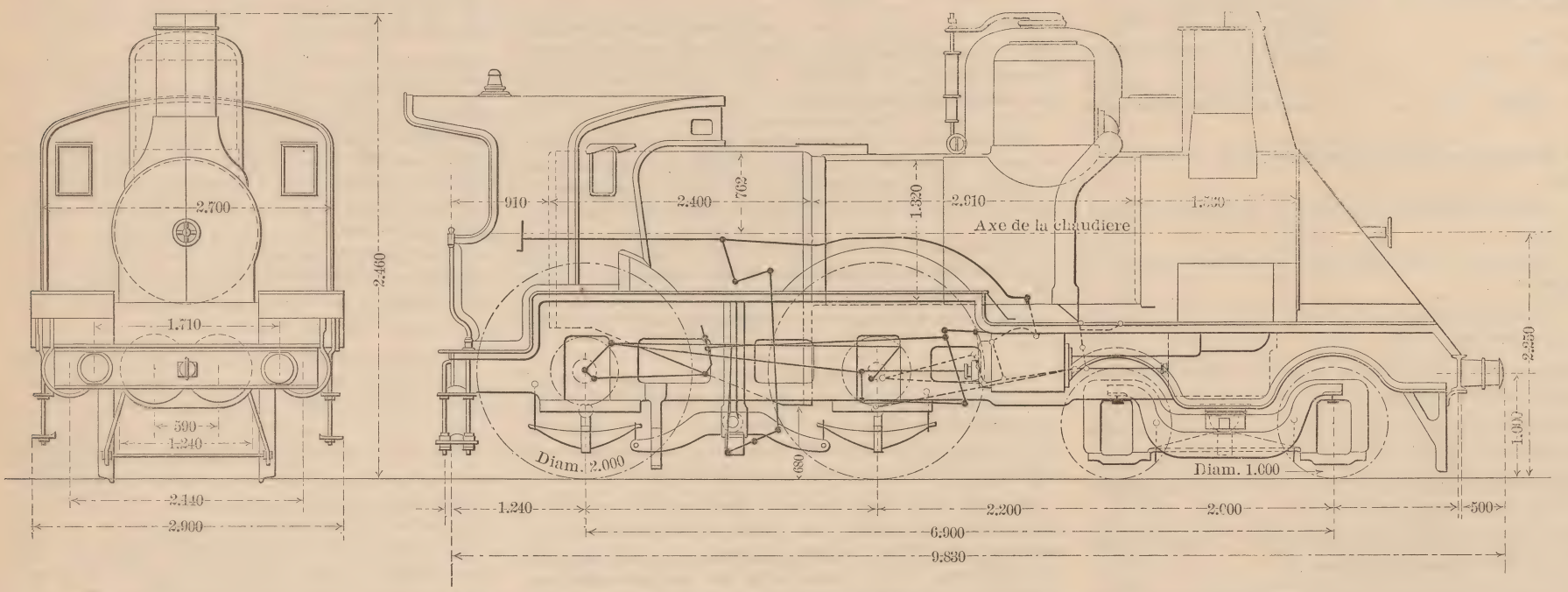
A. E. MITCHELL, S. HIGGINS, G. W. WEST, H. D. GORDON, L. R. POMEROY, *Committee.*

Damages Against Pullman's Palace Car Company.

A long contested suit of the old Central Transportation Company against Pullman's Palace Car Company was practically settled by the United States Circuit Court at Philadelphia, Dec. 18, and an amount, said to aggregate nearly $3,000,000, will probably be collected by the transportation company. The decision was rendered by Judges Dallas and Butler, and the Court appointed Theodore Metting as master to assess damages and submit a report within 60 days.

The Central Transportation Company became involved in litigation with the Pullman Company, but it was finally decided to consolidate the two systems, and on February 17, 1870, a lease was made under which the Pullman Company was to pay the Central Transportation Company $264,000 per annum, subject to certain contingencies.

The Pullman Company paid the stipulated rent as it matured until January, 1885, when a dispute arose, and further payments were refused. The Central Company sued for the next instalment of rent and recovered judgment, which was afterward reverted. Another suit was brought for the next instalment, and the Pullman Company repudiated the lease by denying its validity as in excess of the lessors' authority and against the public policy. This defence was sustained by the Supreme Court. The Pullman Company, while the case was pending, filed a bill for an injunction to restrain further prosecution of the suit and against bringing other suits for subsequent instalments. The Court declined to interfere with the suit pending, on the ground that the validity of the contract could be thus tried as well as in equity, but enjoined against bringing other suits for subsequent instalments. The Pullman Company moved to discontinue the bill, and the Central Transportation Company moved for leave to file a cross bill to enforce return of property or compel compensation. The first of these motions was dismissed and the second allowed in the present decision.



New Design of Locomotive, Paris, Lyons & Mediterranean Railway.

A Locomotive with a Beak.

The outline drawing presented above shows the general construction of one of several locomotives built at the Paris shops of the Paris, Lyons & Mediterranean Railway, and recently put in service on that road. We have mentioned these engines before, but this is the first opportunity we have had of presenting an authentic drawing of one. The engine is designed to offer the smallest possible resistance to passing swiftly through the air. All parts that in locomotives usually present surfaces of considerable area to the retarding effect of the atmosphere have in these engines been provided with beak-shaped shields to split the air and facilitate movement through it. The drawing shows these beak-like arrangements covering the front of the smokebox, the stack, the dome and the cab.

A number of these engines are being experimented with on the Paris, Lyons & Mediterranean Railway. They are compound engines, with large boilers and fireboxes, the latter having brick arches; and the general arrangement of details is such as to facilitate ease and economy of operation. As they have been in service but a short time no definite results have been reported, but it is expected that they will show a considerably improved efficiency over ordinary locomotives of similar dimensions.

Now they are talking of electric motors to haul engines and hose-carts to fires. If they are ever introduced, the heart of the fire-horse will break. The proudest occupation which a horse can fill is to gallop before a fire-engine.

At the annual meeting of the directors of the Michigan Central R. R., held in New York, Dec. 19, the regular semi-annual dividend of two per cent. was declared. The statement showed a surplus, after the payment of all charges and dividends, of $97,472, an increase of $50,000 over last year.

A Nice Christmas Gift.

Mr. James R. Smith, a division superintendent of the construction department of the Pennsylvania Railroad, received as a Christmas present, Dec. 25, his retirement on full salary for the rest of his life. He has been nearly fifty-six years in the company's service and is widely known.

Rumored Changes on the Burlington.

There is a rumor in circulation to the effect that Mr. C. E. Perkins, President of the Chicago, Burlington & Quincy Railroad, will shortly resign, and furthermore that Second Vice-President George B. Harris will succeed to the presidency; that General Manager W. F. Merrill will succeed to the second vice-presidency in place of Mr. Harris; that W. C. Brown, General Manager of the Burlington lines in Missouri and Kansas, will be Mr. Merrill's successor; that Howard Elliott, General Freight Agent of the St. Louis and Keokuk Northwestern Railway, will succeed Mr. Brown, and will have his office in St. Joseph, Mo. How much truth there is in the rumor we are unable to say, but it originated in a Wall Street news agency, and is credited by a number of interests.

English Railway Disaster.

Thirteen persons were killed and 17 injured in an accident that involved the Manchester express, on the London & Northwestern Railway, near Chelford, Dec. 22. An account of the wreck says that the high wind started a freight car down grade on a side track, and sent it into the main line as the express passed. The freight car drove two carriages off the track, and the next three carriages in the express were tumbled after them.

New Plan for Car Interchange at Chicago.

The proposed new arrangement for the interchange of cars between the different railroads at Chicago was briefly described in our last issue. Since then the plan has been adjusted to satisfactorily meet the requirements of the 12 following named roads, which have agreed to enter into the arrangement:

The Lake Shore & Michigan Southern; Chicago, Milwaukee & St. Paul; New York, Chicago & St. Louis; Cleveland, Cincinnati, Chicago & St. Louis; New York, Lake Erie & Western; Louisville, New Albany & Chicago; Chicago Great Western; Wisconsin Central; Chicago & Western Indiana & Belt; Illinois Central; Chicago & West Michigan; Elgin, Joliet & Eastern.

Following are the rules adopted. These were arranged by a committee of the Western Railway Club, consisting of Messrs. J. N. Barr, A. M. Waitt and John Mackenzie:

We, the undersigned, on behalf of our respective roads, agree to interchange cars with the understanding that, in addition to the defects enumerated in Rules 7, 8 and 9 of the M. C. B. Rules of Interchange for which owners are responsible, the following items shall also be treated in the same way, viz.:

1. Couplers or drawbars, drawbar springs, drawbar pockets or spindles, or their substitutes.
2. Draw lugs and attachments, draw timbers or their substitutes.
3. Deadwoods or buffers.
4. End sills.
5. Longitudinal sills.
6. Cracked end and corner posts.
7. Any parts of truck, including brakebeams, and attachments, failing under fair usage.
8. Center plates and all body castings.
9. All bolts.
10. Roofs and running boards defective.
11. Loose and decayed sheathing or fascia boards.

It is further understood and agreed:

First. That, if the damage exceeds the items enumerated under No. 1, so as to include any or all of the items under head of No. 2 or 3, in such case the damage shall be considered due to unfair usage, and no bill shall be rendered; the same agreement to govern in items 2 and 3. Also, that in the case of longitudinal sills no bills shall be rendered for replacement of more than two sills.

Second. That cars which are the property of the railroad companies parties to this agreement shall be interchanged between the parties hereto without requiring cards for defects which may exist in the parts enumerated above.

Third. That in receiving cars from railroad companies, not parties to this agreement, or in interchanging cars not belonging to parties to this agreement, the rules of the Master Car Builders' Association for the interchange of traffic shall prevail.

Fourth. That nothing in this agreement shall be so construed as to require any of the parties hereto to accept cars which may in their opinion be unsafe to run or unsuitable for carrying freight, or with defects for repairs of which they are not authorized to bill, unless the party offering the car furnishes a proper M. C. B. defect card.

Fifth. That in case any party to this agreement should be required to furnish M. C. B. defect cards for any of the items covered by this agreement on cars owned by any party to this agreement, and a bill be rendered on such card, the bill and card shall be a voucher against the party owning the car for an amount equal to the amount of such bill.

Sixth.—That if any party to this agreement should find it necessary to make repairs to any of the items covered by this agreement, the damage to said items not having been caused by collision or derailment, then and in such case the party doing such repairs shall have authority to bill against the party owning the car for the cost of such repairs, the charges for labor and material applied and credits for scrap or good material removed, being in accordance with Master Car Builders' Rules of Interchange; and the party so billing shall certify on the face of the bill that the damage billed for was not caused either wholly or in part by collision or derailment, and that there were no further repairs made or required in connection therewith, the certificate reading as follows: "I hereby certify that this bill is in accordance with special agreement for interchange of cars."

Seventh. That in case any party shall make repairs under this agreement, such repairs shall be made strictly in accordance with Master Car Builders' rules. Evidence that the repairs have not been so made will be authority for non-payment of bill, or for rendering counter-bill in case original bill for repairs has been paid.

Eighth. When repairs are made under this agreement the party making such repairs shall immediately notify the owner of the car, giving date, place, and nature of repairs.

Ninth. In case any party to this agreement may desire any other party to hold material removed from cars, under this agreement, for inspection, the same shall be held, after notice has been received, for a period not exceeding 30 days subsequent to the date of repairs to such cars.

Tenth. Transfer roads may become a party to this agreement by assuming responsibility for any new defects which may be caused while cars are in their possession; but shall not be authorized to bill for repairs made under this agreement.

Eleventh. That there be an executive committee of five appointed to whom disputes shall under this agreement be referred, their decision to be final and binding; also to make rules for the transaction of the business of this association.

Twelfth. Bills for repairs should not be made for damage when there is any evidence of carelessness in handling the equipment.

Thirteenth. Any railroad may become party to this agreement by notifying the Chairman of the Executive Committee and signing agreement.

Fourteenth. That this agreement may continue indefinitely, and that any party hereto may withdraw from the agreement by giving notice to that effect in writing to Chairman of Executive Committee, said notice to be given at least thirty (30) days prior to the date on which such withdrawal goes into effect.

The Executive Committee chosen was J. N. Barr, Chairman; W. Lavery, A. M. Waitt, W. Garstang and P. H. Peck, and this committee was directed to arrange details for a permanent organization.

President's Private Car, B., C. R. & N.

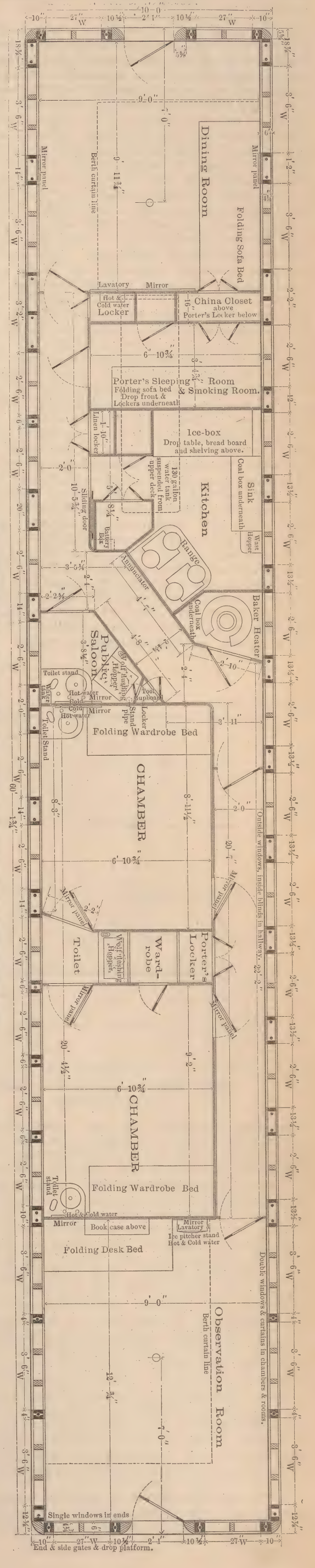
The engraving on this page shows a plan view of a private car built for Mr. J. C. Ives, President of the Burlington, Cedar Rapids & Northern Railway, at the company's car shops at Cedar Rapids, Ia. The car was designed and built by Mr. George D. Brooke when he was Master Car Builder of this road, and we are indebted to him and Mr. R. W. Bushnell, Master Mechanic of the road, for our information concerning the car. It was required that the car should furnish sleeping accommodations for eight people, a kitchen, a dining-room, and an observation-room at each end. The kitchen was to be isolated from the sleeping, dining and observation rooms. The plan view shows how these objects were accomplished. Observation-rooms were required at each end, as the length of the car precluded the possibility of its being turned around as frequently as might become desirable. The length of the car is 60 feet 1⅛ inches over the end sills, and 67 feet 8¾ inches over the platforms. There are no particularly new features in the framing of the body of the car, the matters of particular interest in its construction being confined to the arrangement of the internal space to meet the requirements stated and to furnish as comfortable and convenient accommodations as possible.

The principal sleeping-rooms are in the so-called chambers, which are entered by separate doors from the corridor, and which have a common wardrobe and toilet-room, accessible from each. They have separate marble washstands. The beds in these chambers are made stationary, with drawers underneath for clothing, bedding, etc.

The other sleeping accommodations distributed throughout the car are shown on the plan, and do not require further description. Hot and cold water is furnished throughout the car.

The hoppers have dumping bottoms, and are flushed with water from a tank. The kitchen is furnished with all the appliances and conveniences to make it complete in every detail.

The car is plainly but neatly finished in paneling of cherry and walnut; the headlining, which is of heavy paper, is neatly decorated to harmonize with the finish of the interior.



Private Car for the President of the Burlington, Cedar Rapids & Northern Railway.

Thought He Was the 999.

The fame of the New York Central's great locomotive, the 999, is beginning to set people crazy, as the following dispatch from Chicago, dated Dec. 22, would indicate:

A young man stood on the Rock Island Railroad tracks at Forty-third street to-night, carefully perusing a timetable. Suddenly placing the time-card in his pocket and giving vent to screeches in imitation of a locomotive, he started south on the tracks, followed by a crowd.

When he had gone two blocks a north-bound passenger train was seen coming on the same track. At a convenient switch, however, he side-tracked himself in regular fashion. After the train passed he backed up and started south again on the tracks.

At Forty-seventh street he ran into the arms of a policeman who demanded an explanation. Again the timetable was brought into use, and in a rambling way he said he was Engine 999, and that when he arrived at Burr Oak, he would draw the limited west for 150 miles.

Evidently the young man had *wheels*, but they were neither of the right kind or in the right place to enable him to make 100 miles an hour.

Expiration of Hektograph Patents.

An English patent on this much used copying device has recently expired, and according to American patent laws the American patent expired therewith, so the invention is now the property of the public, and any person may now freely make, use and sell the hektograph.

An approved formula is as follows.

THE COPYING PAD.

Gelatine, by weight	1 part
Glycerine	4 parts
Water	2 parts

THE INKS.

1. Methyl violet	1 part
Water	7 parts
Alcohol	1 part
2. Rosaniline	2 parts
Water	10 parts
Alcohol	1 part

The gross earnings of 52 railroads for the first week in December showed a gain of $81,195, or 1.1 per cent. The following table shows the gross earnings of 54 companies for the second week, compared with the same week a year ago:

Second week in Dec.	1893.	1894.	Differences.		P. C.
Thirty-six companies	$4,000,797	$4,296,284	Inc.	$495,487	7.0
Eighteen companies	2,778,940	2,552,641	Dec.	226,299	8.1
Total 54 companies	$6,779,737	$6,848,925	Inc.	$69,188	1.0

Notes of Travel.

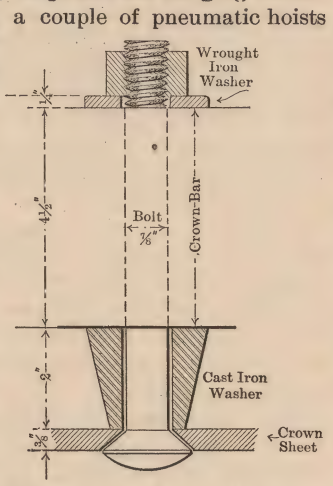
The best way to go from New York to St. Louis is via the New York Central to Buffalo, the Michigan Central to Toledo, and thence over the Wabash. Through Wagner sleeping cars run on this route between the cities named, and the distance is covered in about 38 hours. The impressions a stranger receives on entering the new Union station at St. Louis are very surprising, but are altogether complimentary to the enterprise of the railroads that built it and to the architects who designed such a comfortable, commodious and beautiful depot. The writer had read a good deal of this largest depot in the world, but he was not prepared to find it the most conveniently arranged and most beautifully designed and ornamented of any structure designed for a like purpose. The trainshed is 700 feet long, and the arch is 100 feet above the tracks, of which there are 30 with a wooden platform beside each. These platforms are to be eventually supplanted by granite pavements. Leaving the track inclosure one may pass directly to the street by a few easily ascended steps, or he may enter the general waiting-room, which is on a level with the tracks. This is spacious and comfortable and has all usual modern conveniences, including ticket offices, etc. Separated from this room, but on a level with it, is the second-class waiting-room, which certainly is very comfortably arranged and cleanly kept. In these rooms one finds the usual depot accommodations, and the writer was not prepared for anything very different. But noticing a spacious stairway leading from the center of the general waiting-room, he mounted its easy assent and experienced a most enjoyable surprise, occasioned by the grandeur and beauty of "the grand waiting-room." This room is 120 feet long, 60 feet wide, and the beautifully arched and gold decorated ceiling stands 60 feet above the smooth mosaic floor. Stained glass windows shed a cathedral light by day and 3,000 incandescent lamps illuminate the room at night. Most of these lamps are held by a great wrought iron chandelier, which of itself must weigh several tons, but which apparently is sustained by a pane of glass in the skylight overhead. The broad expanse of beautiful mosaic floor is not marred by seats or benches in the middle, but is kept clear of all obstructions.

Long benches, with seats upholstered in leather, are ranged along the side and end walls. These end walls are features of great beauty in design and ornamentation. The decorators showed their good taste by choosing "the female form divine" as the best ornament; it forms the chief decorative feature at the end walls. At about 20 feet and 40 feet respectively above the floor there are arched balustered alcoves that add greatly to the beauty of the end walls. Standing on the balustrades of each upper alcove are two female figures with extended arms holding in each hand an incandescent lamp. The effect at night can be more easily imagined than described. It is perfectly beautiful. At one end of this room doorways lead to the men's waiting-room and to a café. At the other end of the grand waiting-room doorways lead to a ladies' waiting-room, and from the far end of this room one doorway leads to a ladies' retiring-room, where lavatory accommodations are provided, and another doorway leads to a parlor exclusively for ladies, and furnished as comfortably and luxuriously as the parlor of a first-class metropolitan hotel.

In studying the accommodations of this elegant railway station one cannot help but conclude that travelers who have occasion to wait in it for trains must long remember the experience with pleasure, as they certainly could hardly be more comfortable at home or in a good hotel.

The Missouri Pacific shops at St. Louis are running on short time and are doing nothing in the way of new work, the present object being to get along as economically as possible. Master Mechanic L. Bartlett informed the writer that the new tender trucks having cast-steel bolsters, several of which have been used on this division since last spring, have been giving excellent satisfaction. This form of truck was illustrated in the NATIONAL CAR AND LOCOMOTIVE BUILDER for April, 1894. The writer was shown one of these trucks under the tank of an engine that had just come in off the road. It had been running a year and had not required the least attention or tightening up. The wheel flanges showed scarcely any wear, and this was not greater on one side than the other.

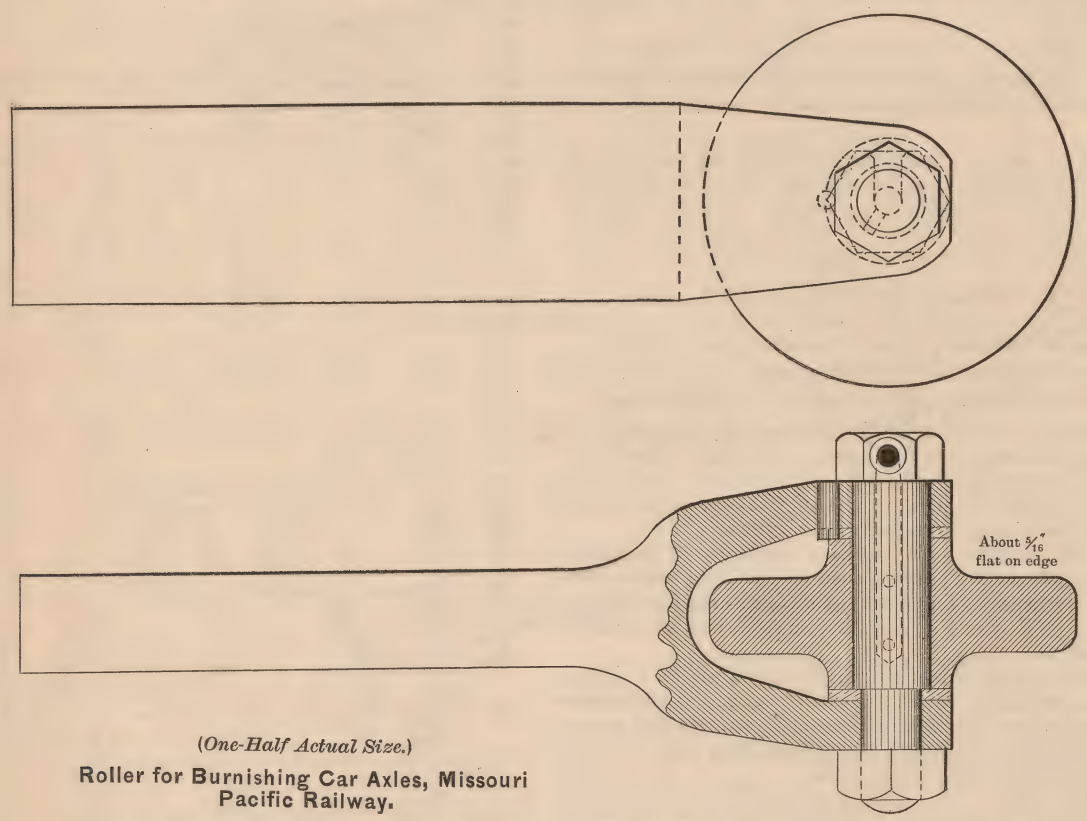
A very useful device is arranged in the boiler shop for handling sheets between the forge and the flanging blocks. These being close together, a couple of pneumatic hoists have been mounted on a circular tramway that reaches all the desirable points. Besides facilitating the work, this improvement enables two men to do work that formerly required six men.



CROWN BAR BOLT, MISSOURI PACIFIC RAILWAY.

One seldom hears of a locomotive boiler explosion on the Missouri Pacific. The mechanical officers attribute this largely to the use of the crown-bar bolt illustrated herewith. This bolt passes through the crownsheet, a cast-iron washer, the crownbar, and a wrought washer and nut on top of the bar. The parts named are held together rigidly. It has been found that in case the crownsheet becomes overheated the first result is to open a leak between the bottoms of the cast-iron washers and the crownsheet, and this has been found sufficient to put out the fire without causing further damage.

The most effective way found on this road for preventing "hot-boxes" has been to give all axle and crankpin journals as smooth a finish as possible before they enter service. Mr. Bartlett designed a cheap and very effective way of accomplishing this, by the use of the tool shown herewith, reduced to one-half the actual size. It is a roller for burnishing the journals after they have been finished in the lathe. It is made of tempered steel, and has a smooth, highly polished surface, the face being flat for about $\frac{5}{16}$ of an inch. It is held in the manner shown by a wrought-iron bar which is placed in the headstock of the lathe when used. The rolling given a journal by this means imparts a high polish to it and compresses the surface metal so that an excellent bearing is formed. The polish and smoothness of journals so treated exceed anything of like character ever seen by the writer except as the result of service.



(One-Half Actual Size.)

Roller for Burnishing Car Axles, Missouri Pacific Railway.

Col. John H. Bass, the car-wheel manufacturer, of Fort Wayne, Ind., is said to be the wealthiest man in the State of Indiana.

Two members of the Cook gang of train robbers were recently sentenced to 20 years imprisonment at Detroit, Mich., by the United States Court at Fort Smith, Ark. Another member of the gang was sentenced to 30 years imprisonment.

The right of way for an electric railway from Merced to the Yosemite Valley is said to have been secured. The capital stock will be $2,500,000. The power is to be established at three points on the Merced River. The road will be broad gauge, and will serve the region for freight and passengers like ordinary railroads.

Annual Report of the Interstate Commerce Commission.

According to the eighth annual report of this Commission, which has just been submitted to Congress, the Commission recommends that it should be given authority to investigate railroad strikes. The report suggests that the Commission should have authority to enter upon immediate investigation when strikes or lockouts are apprehended, have the testimony of all persons, and the aid of judicial process to compel such testimony and to enforce proper recommendation based upon the investigation.

Speaking of the financial condition of railways, resulting from the commercial and financial depression and other causes, the report says that on June 30, 1894, there were 156 roads in the hands of receivers. The mileage operated by these companies was about 39,000 miles, representing a capitalization of upward of $2,500,000,000, or 25 per cent. of the total railway capital of the country. Eighty per cent. of the mileage, and 79 per cent. of the capitalization, are accounted for by 28 of the more important of such roads, the balance of the number being largely made up of small, less important lines. While the financial depression has been a factor in bringing about the embarrassment of railways, it is believed that many of the receiverships were the natural sequence of mismanagement, over-capitalization and ill-advised projections.

The Commission includes in its report statistics of railways for the year ending June 30, 1893. On that date there were 176,461.07 miles of line in the United States, being an increase during the year of 4,897.55 miles. The number of railway corporations was 1,890, being an increase of 68 over the previous year. Of these, 939 maintained operating accounts, and 778 were subsidiary lines, or parts of larger systems, of which 326 were leased for fixed money rental, 195 for a contingent money rental, the remainder being operated under some other form of traffic agreement. The tendency toward consolidation is shown by the fact that 28 roads were merged, 20 roads were reorganized, and 16 roads consolidated into other systems. There were 42 operating companies having a mileage in excess of 1,000 miles. The capitalization of the roads reporting was $10,506,235,410, equivalent to $63,421 per mile of line. The number of passengers carried was 593,560,612, and the number of tons of freight carried was 745,119,482. The gross earnings were $1,220,751,874, the operating expenses $827,921,299, leaving net earnings of $392,830,575, which is equivalent to $2.314 per mile of line. Adding to this the income from other sources to the amount of $149,649,615, gives as the amount available for the payment of fixed charges and dividends $542,482,190. From this there were paid $431,422,126 as fixed charges; dividends and other payments from net income, to the amount of $102,941,289, leaving a surplus of $8,116,745. The number of employees was 873,602, being an increase over the previous year of 52,187. The number of employees killed was 2,727, an increase of 173, and the number injured was 31,728, an increase of 3,462. The number of passengers killed was 299, being a decrease of 77; the number injured was 3,229, being an increase of only 2 over the previous year. It is stated that all new cars ordered by the railways are being supplied with automatic couplers, and a large proportion with air brakes. The accidents of the year show little decrease on account of the use of automatic couplers, and such a result is not expected until more uniformity in such appliances has been attained.

A Progressive Railroad Manager.

As many of our readers will remember, Mr. F. W. Barrow, Manager of the Ferro Carril del Sud, of the Argentine, the largest railroad in South America, made an extended tour of the railroads in the United States last spring, and later visited England. His purpose was to study the most improved methods of operating North American railroads. A gentleman who lives in the Argentine has written to the NATIONAL CAR AND LOCOMOTIVE BUILDER to say that Mr. Barrow has now returned to Buenos Aires, and again resumed control of the great railroad of which he has charge. Our correspondent says that Mr. Barrow "brought back with him the best of impressions regarding American railroads. All that he has lately seen, together with the latest improvements for bettering public traffic, etc., which came under his observation, will be put in practice and usage on the railroad of the South."

The Ferro Carril del Sud has long been, as the writer well knows from personal observation, the best equipped and managed road in South America. That the manager of such a railroad would leave the country to search for possible improvements in the practice of foreign lands is an assurance of intelligence, foresight and breadth of mind that will surely bring the operation of the enterprise they are employed in managing to the highest state of efficiency and economy.

The Cleveland, Cincinnati, Chicago & St. Louis has issued a circular announcing that hospitals will be established by the company at several points on Feb. 1.

The Clyde steamer Algonquin sailed from Jacksonville, Fla., Dec. 11, bearing 30,000 boxes of Florida oranges; thus breaking the world's record for an orange cargo by 11,000 boxes.

The American Society of Mechanical Engineers.

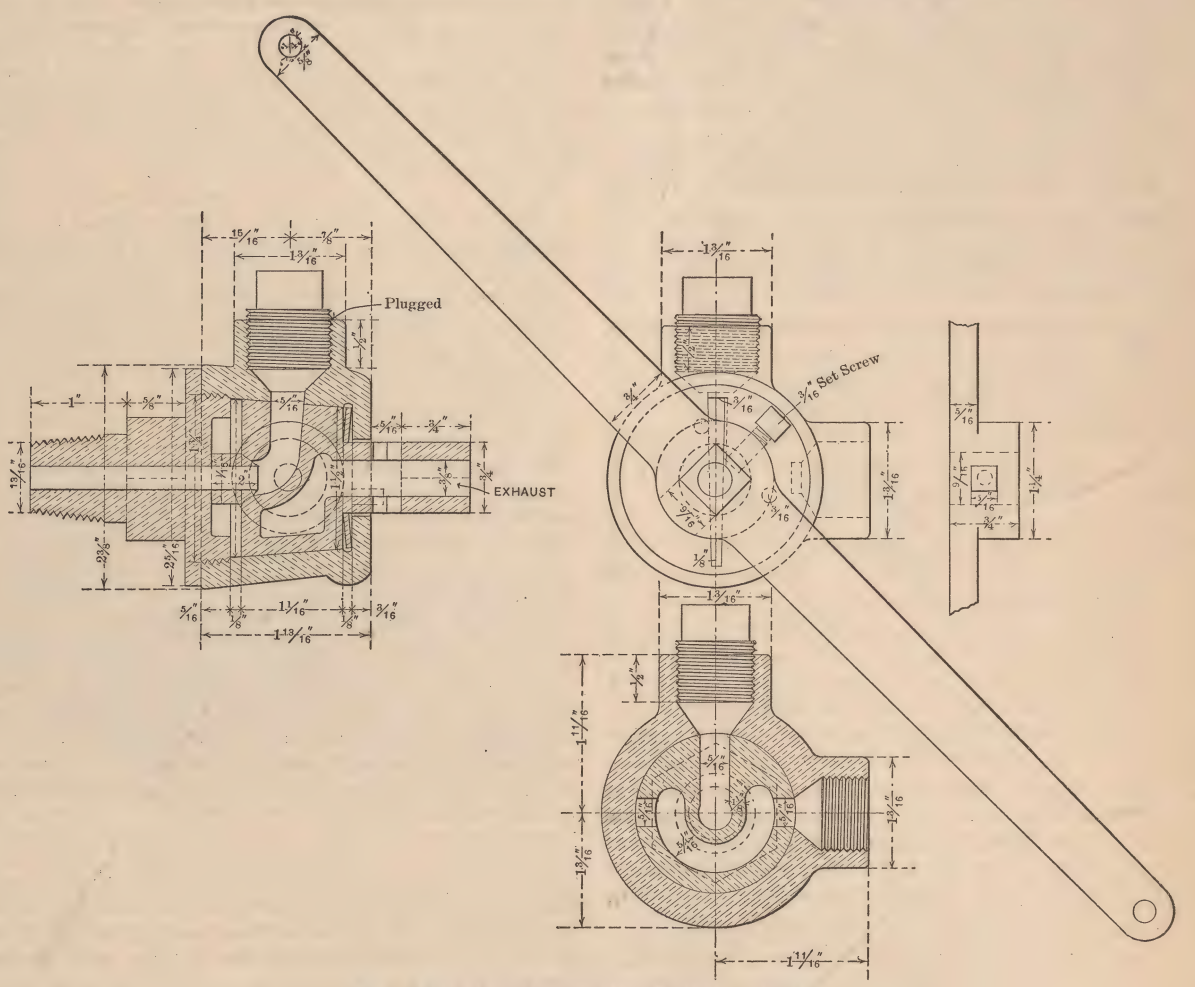
According to the programme announced in our last issue, the 15th annual meeting of the above-named society was held in New York early in December. The attendance was larger than at any previous meeting. A plan was adopted at this meeting which enabled the members to identify each other easily, when not already acquainted. The lines of the register were numberrd consecutively. Each member, when he registered, was presented with a hard rubber tag bearing the same number as the line he had registered upon. Each tag was formed with a slot so that it could be held upon the coat lapel by the usual button. In addition, the registry list was printed in the order in which it was signed, and these strips of printed names were distributed. By the aid of this simple method every member could, if he so desired, know the name of every other member. If a member wanted to know the name of another he noted the number on the other's tag and consulted his printed list.

The following officers were elected: President, E. F. C. Davis, General Manager Richmond Locomotive and Machine Works, Richmond, Va. Vice-Presidents, F. H. Ball, New York city; Jesse M. Smith, Detroit, Mich.; M. L. Holman, St. Louis, Mo. The Vice-Presidents holding over are: C. E. Billings, Hartford, Conn.; Percival Roberts, Pencoyd, Pa.; H. J. Small, Sacramento, Cal.

Pneumatic Hoists for Railroad Shops.

We present herewith drawings of a compressed air hoist used in the locomotive shops of the Union Pacific Railroad at Omaha, Neb.

These shops are the best equipped with pneumatic appliances of any railroad shop we are acquainted with. The officers superintending the operation of these shops have given special attention to the subject, and have succeeded in developing a number of exceedingly useful pneumatic appliances. In previous issues during the last year we have illustrated a number of these on a sufficiently large scale and sufficiently in detail, so that similar appliances could be built from our drawings by those who wish to do so. In addition to the appliances we have previously described, and that are in use in these shops, perhaps the most useful are the small hoisting cylinders that are scattered promiscuously about the shops and save an immense amount of manual labor in lifting and handling materials at the different machines. Our illustration shows the construction of one of these, and of the carriage used in connection with it on the overhead tramway. Such a hoist is used particularly for lifting and handling work at wheel presses, large planers, etc. Cylinders of like construction, but in sizes to suit the work to be handled, are located throughout the shop. The cylinder is made of 10 inch wrought iron pipe. The pipe is not bored, but is rattled and then a mandrel is pressed through it to make it smooth. The whole construction of the device is so plainly shown in the drawings herewith that further description would be mere repetition. The air valve, being a very important part of the apparatus, is illustrated on an enlarged scale on this page. An exterior view is presented showing the construction and method of attaching the regulating lever, which is made of wrought iron, and also cross and longitudinal sectional views of the valve, which is composed of brass castings.

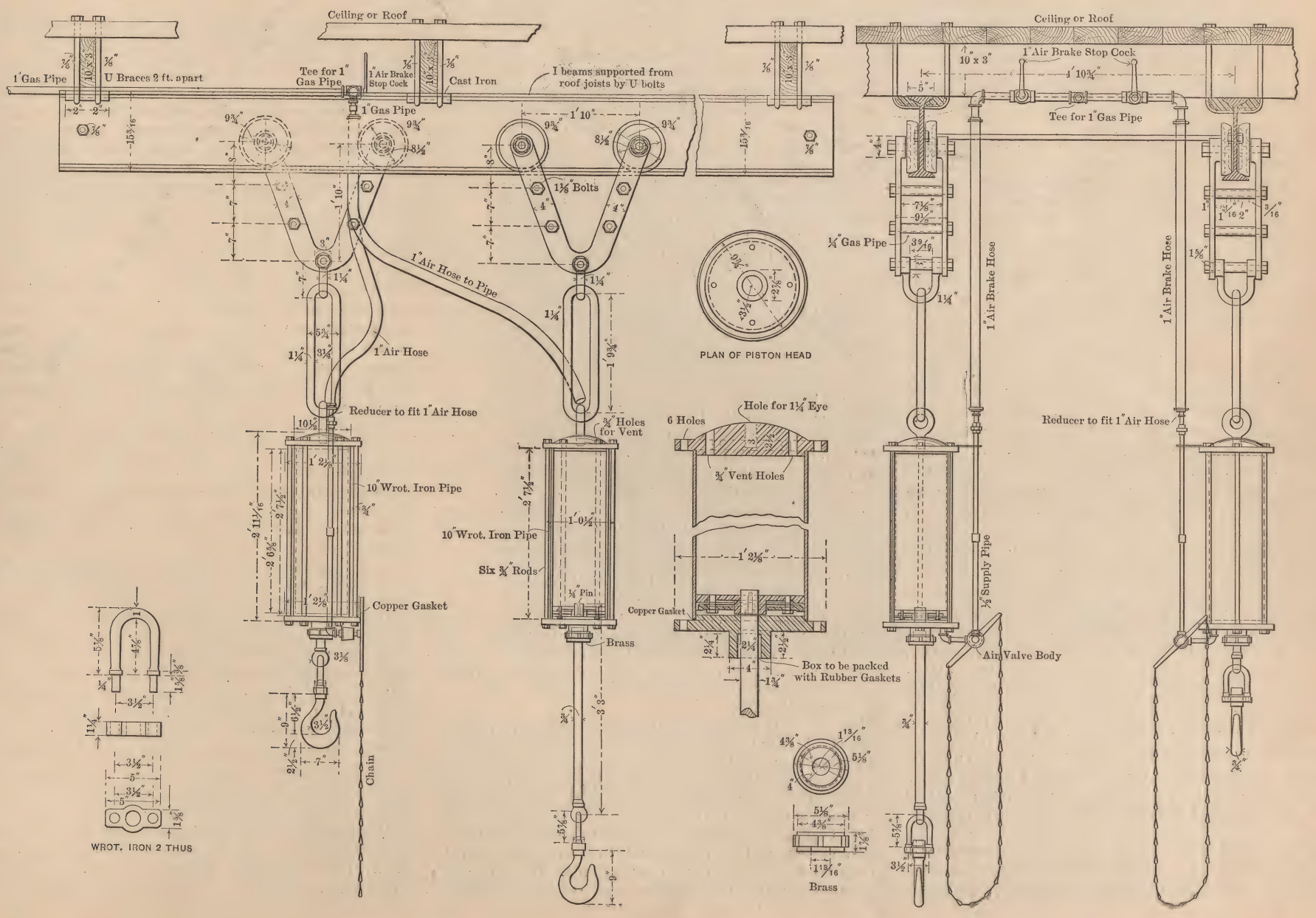


Air Valve for Pneumatic Portable Hoists.

The longest distance a letter can be carried within the limits of the United States is from Key West, Fla., to Ounalaska, 6,271 miles, and all for two cents.

The Baldwin Locomotive Works have substituted in place of overhead shafting an electric motor for each machine in its shop devoted to wheel work, and has effected, it is said, an important economy of fuel thereby. The motors employed to operate the machines were furnished by the Gibbs Electric Company, of Milwaukee.

A train on the Sioux City & Pacific road played juggernaut with cattle a few miles south of Sioux City, Ia., Dec. 13 The train rounded a curve running very fast, and the engineer saw a herd of cattle on the track. He realized that he could not stop the train and that to slacken would make matters no better, so he pulled the throttle wide open and sailed into the herd. The train plowed its way through the cattle without leaving the rails. It was found that 22 cattle were killed or so badly injured that they had to be shot.



Pneumatic Portable Hoist for General Work, Union Pacific R. R.

Locomotive Fuel.*

BY WILLIAM FORSYTH.

To illustrate the vast amount of coal used by the railroads, and the cost of this item in proportion to other expenses, I will give some statistics from the accounts of the C., B. & Q. R. R. The largest item in the operating expense account is engine service, being 22 per cent. of the total expense for the year 1893. The largest item in the cost of engine service is wages, and next to that is fuel. The relative proportion of the principal items in cost of engine service, as an average for 10 years—1883 to 1893—is: Fuel, 30.7 per cent.; wages, 39.0 per cent.; repairs, 27.6 per cent.; miscellaneous, 2.7 per cent.

The total amount of fuel used on the C., B. & Q. R. R. in the year 1893 was 925,270 tons, costing $1,291,108. An idea o this vast amount of coal may be realized when it is stated that it is twice the whole amount of coal consumed in the city of Chicago in the year 1893 by all her industries and in all her heating and power boilers. The consumption of coal by locomotives in the United States in the year 1893

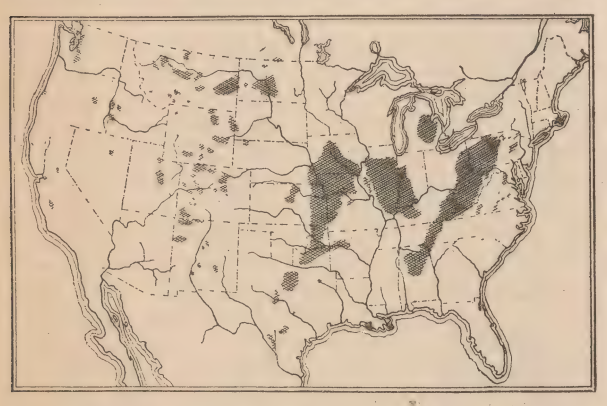


FIG. 1.—MAP SHOWING DISTRIBUTION OF COAL FIELDS IN THE UNITED STATES.

amounted to 50,000,000 tons, or about one-third of the whole production of bituminous and anthracite coal in this country.

The rank of the different coal producing States, as shown by the 11th census, in 1889, was for bituminous coal as follows in millions of tons: Pennsylvania, 82; Illinois, 12; Ohio, 10; W. Virginia, 6; Iowa, 5; Alabama, 3.3. Fig. 1 shows the general distribution of coal in the United States. As much of the coal underlying this large territory is in thick seams and of fairly good quality, there is no necessity for mining and using so much poor coal as is now put on the market. This brings us directly to the questions: "What is good coal?" "What is poor coal?" "How can good coal be determined?" and "What amount of impurities should be allowed in commercially good coal?" Coals present a remarkable example of a great staple whose market values are arbitrary. Inferior coal should not command the same price as superior coals in the same market. Fuels do not take their standing in the market from constituent units. Iron masters buy iron ore by the per cent. of iron they contain and the same is true of copper, lead and silver ores. The principal reason why coal is not put on a similar basis is the difficulty in getting an average sample, and because laboratory methods are not more generally used. The value of a coal is not wholly dependent upon its per cent. of combustible matter, but varies with the relative per cent. of water, sulphur and ash, and it is also necessary to confine comparisons to coals containing nearly the same relative per cent. of volatile matter and fixed carbon. The methods in use for determining the heat value of coal are: 1st. Chemical analysis. 2d. Calorimeter test. 3d. Test on small boiler. 4th. Test on a large scale on locomotive.

The following table, giving the per cent. of ash in the Illinois coals, and the heat value determined by the calorimeter, in the C., B. & Q. laboratory, shows in a striking manner the difference between a lump of clear coal and the average quality of the same coal. The second column shows the small amount of ash, and the fourth column the high efficiency of the selected lump, while the first and third columns show the high per cent. of ash and the low efficiency of the average sample taken from all parts of the car:

TABLE I.—ILLINOIS COALS.

	Per cent. ash.		Efficiency.	
	Average.	Select.	Average	Select.
Streator	8.		100.0	
Streator	10.4		99.0	
Streator		2.67		114.4
Peoria	11.44		99.0	
Peoria		7·0		102.7
Edwards	13 55		95.3	
Edwards		5.5		107.2
St. David	17.0		96.0	
St. David		5.3		107.8
Dunfermline	19.0		91.2	
Dunfermline		6.5		105.0
Bryant	22.0		86.5	
Bryant		9.32		103.0
Elmwood	35.5		76.8	
Elmwood		15.0		96.2

The directions for collecting samples of coal for analysis at the C., B. & Q. laboratory are as follows:

"Two samples should be taken, one marked 'average,' the other 'select.' Each sample should contain about 10 lbs., made up of lumps about the size of an orange, taken from different parts of the dump or car, and so selected that they shall represent as nearly as possible: 1st, the average lot; 2d, the best coal. Samples should be marked: Name of mine; name of operator; town, county and State."

Methods of Analysis.—The moisture is determined by heating a known weight of coal for one hour at a constant temperature of 105 deg. C., or slightly above the boiling point of water. From the loss in weight the percentage of moisture may be calculated. For the other components, excepting sulphur, a second weighed portion of coal is heated in a covered crucible to a dull red heat for 3½ minutes; the temperature is then raised to a bright red heat for an equal length of time. After subtracting the amount of water previously determined, the loss in weight represents the volatile combustible matter. Longer subjection to heat would be at the expense of the fixed carbon. The coke which remains in the crucible after the volatile matter has been driven off, is again subjected to a red heat (with cover of crucible removed), until the remaining carbon is consumed. This is taken as the amount of fixed carbon. The weight of the residue gives the percentage of ash. It is essential that similar conditions be maintained for each sample in a series of coal analyses. The determination of sulphur is made independently, no attempt being made to distribute it among the elements in the previous analyses. The sulphur which is already oxidized in the coal, and which is separated as sulphate, will, however, be found in the ash.

Moisture.—Moisture in coal is doubly deleterious, causing a negative loss by adding to the weight without increasing the heating value, and a positive one, by requiring evaporation.

Volatile Combustible.—The volatile combustible matter comprises in a general way the gaseous constituents of coal. When their combustion is complete these gases have high calorific power, but owing to the devices in common use, the volatile portions of bituminous coal are almost entirely wasted passing off in clouds of carbon, accompanied by the gases of combustion and distillation. In this manner a large portion of the inherent virtue of the coal is worse than wasted. The difficulty of effecting complete combustion of the volatile portion of coal is the cause of the smoke nuisance. The simple requirements of high temperature and a proper supply of air are so difficult to secure that, after all the agitation and study given to the subject, comparatively little progress seems to have been made.

Fixed Carbon.—In the fixed carbon lies the greatest value of coal, though in uniting with oxygen only about one third as much heat is developed as in the union of an equal amount of hydrocarbons, as its non-volatile properties insure for this portion of the coal more complete combustion. The percentage of fixed carbon is therefore the best basis for a comparison of coals for steam purposes. A sufficient quantity of volatile matter must be present to insure easy ignition and free combustion. The oxidation of the fixed carbon tends to heat the volatile gases up to a point of ignition, and then if a proper amount of oxygen is supplied, we obtain a temperature in the furnace and the tubes much higher than that obtained where fixed carbon, such as is found in anthracite coal, is burned without mixture with any large amount of hydrocarbons. In the combustion of anthracite coal, which is largely fixed carbon, an intense local heat is developed near the grate bars, but the temperature of the gases is not so intense; hence the necessity of a large grate and shallow firebox with anthracite coal, so that the radiant heat from the ignited fixed carbon can be directly absorbed by a large crown sheet.

Ash.—The residue left after combustion has no positive effect in reducing the efficiency of the fuel, but is generally an inactive constituent, from which nothing is realized, and this always at constant expense.

When the approximate value of a coal is found by its contents of combustible matter, the actual value for boiler purposes is not exactly proportioned to this percentage, for a deduction must be made for increased cost of firing and removal of ash, since with every reduction of fuel elements, a corresponding increased amount of coal must be burned to make the same quantity of steam.

Sulphur.—When in a condition to be easily oxidized, the injurious effects of sulphur more than offset any addition of the calorific power of coal. Its presence in large percentage is seen in the tendency of the coal to slack and disintegrate when exposed to the weather. Even under cover sulphurous coals will not stand storing for any length of time. Spontaneous combustion in the mines is often due to the presence of this element. In coal the sulphur is generally combined with iron, forming pyrite, or the sulphuret of iron. This is very susceptible to oxidation.

The analysis of coal is one of the simplest and easiest determinations made in the laboratory, and I believe if this fact was more thoroughly realized that the purchase of coal would be regulated more by coal analysis. A bright boy, with an ordinary education, could in a few days learn to make the principal determinations in a coal analysis. The volatile matter and coke can be determined in ten minutes, and the separation of coke into fixed carbon and ash requires from one to two hours, depending on the per cent. of ash, a large per cent. of ash requiring the longer time. The determination of sulphur requires about five hours, and as a regular thing the sulphur determination is not necessary. When the coal is found to be very bad in sulphur it is not desirable for fuel for any purpose, and small percentages are objectionable only as they reduce the fuel value.

A coal test on a larger scale is that made by measuring the coal and water used on a locomotive, and getting a sufficient number of trips under conditions as nearly constant as possible, so as to get average results, which will be compared with other tests. In 1885 the C., B. & Q. R. R. Co. made an exhaustive series of tests of this kind for all the Illinois coals that were then used, and the results are given in the table below. The comparison of the actual heat value of the coal, and the price charged for it, as shown in the last two columns, is interesting, and illustrates the importance of the purchase of coal on a basis of its real value, as I have here advocated.

Few railroads weigh the coal used on locomotives; and so long as this is the case, locomotive records are of little use in ascertaining what progress is being made. Again, the weight of the trains hauled is very indefinite; and pounds of coal per car-mile, or miles per ton of coal, cannot be used for exact comparisons. I believe that our roads will soon adopt a rating of trains in tons instead of cars, and then a closer approximation to the actual work done can be made, as reports will show coal used per ton-mile. If weigh scales are put in at coal chutes, and coal weighed onto engine, we will then have some exact basis to work on.

*Abstract of paper read to the December meeting of the Western Railway Club.

TABLE II.

Coal Tests on C., B. & Q. R. R. with Class A Engines, in Freight Service on Galesburg Division, July, August and September, 1885.

Each coal was used on 6 to 8 trips. Deep firebox, grate surface ..17.6
Temperature feed water, 70° to 75°. Heating surface tubes..1,078 sq. ft.
Thermometer, 70° to 80°. Heat'g surface firebox..112 sq. ft.
Boiler pressure, 138 lbs.
Speed, 19 miles per hour. Total.....1,190 sq. ft.

Name of Coal.	Lbs. Water Evaporated per lb Coal.	Comparative Evaporative Value. Streator Coal taken as Unity.	Cost at Mine.	Actual Value.
Streator	5.65	1.	$1.30	$1.30
Kewanee	4.09	.724	1.45	1.05
Galva	4.48	.793	1 25	.99
Edwards	4.37	.773	1.15	.89
St. David's	4.76	.842	1.15	.97
Elmwood	4.81	.851	1.30	1.11
Norris	4.58	.811	1.15	.93
Kramm's	4.50	.796	1.15	.92
Colchester	5.63	.996	1.875	1.87
Cleveland, Ill.	5.05	.894	1.50	1.34
Astoria	5.15	.912	1.20	1.09
Winchester	5.02	.888	1.525	1.35
Belleville	5.29	.937	1.25	1.17
Mendota, Mo	4.65	823	1.30	1.07
Carver	5.03	.890	1.30	1.16
Albia	5.20	.920	1.40	1.29
Whitebreast	4.94	.874	1.45	1.27
Jumbo, Penn.	7 25	1.283	....	....

At about the same time tests of the Class A engines in passenger service, on same division, showed an evaporation of 5.6 lbs. water at 70° F. per lb. coal.

To illustrate the use of present records, based on coal per car-mile, I have made a diagram, Fig. 2, to see what the indications were for the past ten years. The lower diagram gives the average cost of coal per ton, and it will be seen that it varies from $1.20 to $1.50, averaging nearly $1.37, the price being lower now than in 1883. The pounds of coal per car-mile have increased gradually in a decade from 5½ pounds to 6½ pounds, or 18 per cent. This would seem to indicate that larger grates, fireboxes and boilers, straight stacks and other changes made since 1883 have increased the coal consumption per unit, instead of diminishing it. But in a comparison of the performance of our class A 17 inch and class H mogul engines, in freight service on our Galesburg division, it is found that the H engines haul a loaded car

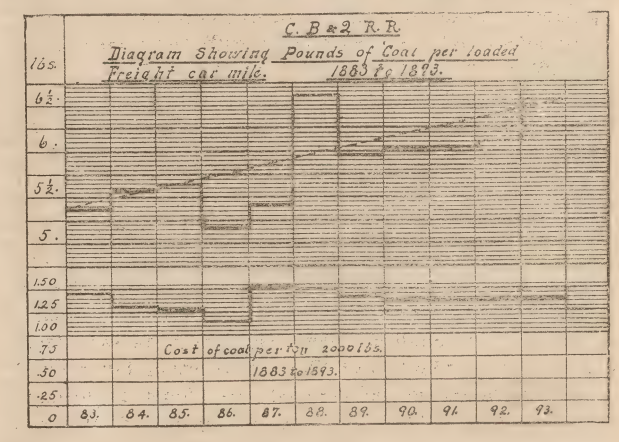


FIG. 2.—DIAGRAM SHOWING COST AND CONSUMPTION OF COAL FOR TEN YEARS ON C., B. & Q. R. R.

with much less coal than the A. The grate surface of the A engines is 17.6 square feet, and the H 27 square feet, and the fireboxes are larger in proportion, the A being a deep box between frames, and the H a Belpaire box above frames.

Forty H engines in freight service averaged 16.64 miles per ton of coal, and 17-inch A engines 20.39—the showing on this basis being best for the A engines. But by obtaining a closer approximation to the actual work done, and expressing it in pounds of coal per loaded freight car, we find the 40 H engines average 4.61 pounds of coal per loaded freight-car-mile, and the A engines 6.32, a difference of 37 per cent. in favor of the larger engines. Our compound H engine in the same service shows a much less coal consumption than any others, being only 3.27 pounds per loaded freight-car-mile. A Class A 17-inch engine with Belpaire boiler, in the same service, shows 4.36 pounds coal per car-mile, being less than any other A engines.

The C., B. & Q. R. R. equipment in 1883 was all small fireboxes, 17 square feet of grate and less, excepting 27 consolidations, having 27½ square feet of grate. In 1893 we had increased the equipment by the addition of 100 engines having large fireboxes and 27 square feet of grate. In 1883 the average grate area per engine was 16.37 square feet. In 1893 the average grate area per engine was 18.95 square feet, an increase of 15.7 per cent. With the introduction of 100 large locomotives to an equipment of 446 small ones, we should expect a very material improvement in the fuel economy, but the records as now kept show for the whole road an increase of 18 per cent. in pounds of coal per loaded car-mile in 10 years.

As the principal part of my paper does not admit of much discussion, I suggest as a matter for profitable discussion the question whether these figures give us the actual measure of coal consumption for an exact comparative unit. The question may be made a general one in the form: 1st. Are we making any progress in economical coal burning? 2d. How can it be most easily and exactly shown from yearly accounts? 3d. What is the best method of showing fuel consumption so as to properly grade the performance of the enginemen? 4th. Will it pay to keep records in sufficient detail to show what we are actually doing in this direction?

The officials of the Delaware, Lackawanna & Western are congratulating themselves over the capture of three young scoundrels who have made numerous attempts to wreck trains in the vicinity of Owego and Waverly N. Y., but fortunately without success. It is said that these fellows were led to attempt train wrecking as a result of reading trashy Indian and Wild West stories.

A South American Railroad Shop.

The following description of the shops of the *Ferro Carril Oeste* (Western Railway), at Tolosa, in the province of Buenos Ayres, Argentina, has been sent us by an Argentine correspondent:

The shops cover an area of 150,000 square meters, and give employment to 407 mechanics and laborers, and the average amount of work done per month consists of repairs to 4 engines, 5 carriages, 31 wagons and 10 brake vans. The locomotive machine shop covers 1,000 square meters, and can accommodate 40 locomotives. Locomotives erected here have English boilers and American wheels and cylinders, all other parts are home made. The company possesses three classes of engines, viz., English, American and French, and in the yard there are a quantity of old engines which previously belonged to the provincial government, but are no longer of any use. The machinery in this shop comprises two planers, four shapers, seven drilling and two milling machines, three small hand lathes, one axle and one wheel lathe, one double emery grinder, all of which are driven by a vertical steam engine of 50 horse-power. There is a 25-ton overhead traveling crane to lift locomotives. Adjoining the erecting shop are the tin and coppersmiths' shops, where all the lamps, oil-cans and tinsmith work are made.

Mr. Thomas L. Chubb is the Locomotive Superintendent of this road. He has held the position since the road was purchased from the Provincial Government, about four years ago, and has had many difficulties to surmount in getting the property of his department in efficient condition. Agreeable to the usual condition of government operated railroads, he found the rolling stock of this road badly run down and ridiculously inadequate to the needs of the traffic. By good management, improved shop facilities and industrious perseverance he has now "got things square," as he says. South American shops generally have a liberal sprinkling of English mechanics, but in the Tolosa shops they are conspicuous by their absence, only two Englishmen being employed in the shops, one of whom is a foreman and the other a lad. Mr. Chubb prefers any nationality other than Englishmen, as they are such proverbial grumblers, while the French, German and others are steady, hard-working men, who do first-class work and more of it for their money than the average Englishman. Mr. Chubb finds milling machinery most valuable. Several of the cutting lathes in this shop have been entirely built in the works, and are equal to the best that could be made in England. Nearly all the tools used throughout the works are made on the premises.

Adjoining the machine shop is the foundry, covering 1,280 square metres, where all the castings required for repairs to the rolling stock, new buildings, etc., are made. There are two cupolas, one of 2½ tons and the other of 2 tons capacity; these are worked by two blowers driven by a five horse-power horizontal engine. There is a 3½-tons pivot crane for lifting work. All the work in this department is carried on by piecework.

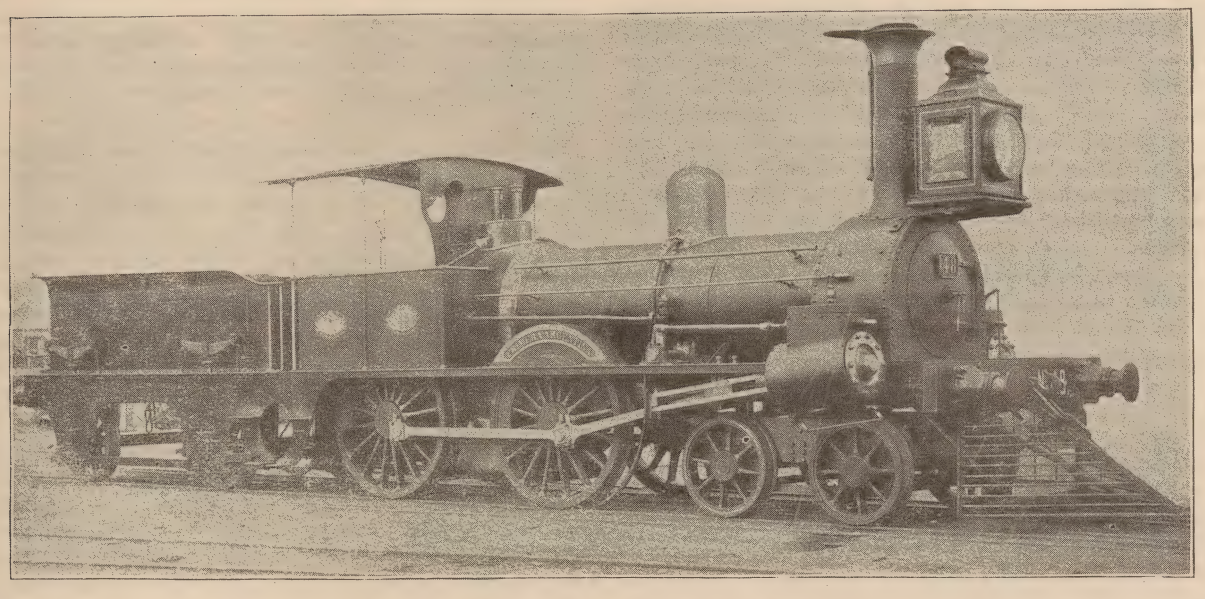
The next building is the smith's shop, covering 3,200 square metres, and in which there are 40 smiths hearths complete, one 20 cwt. double-acting steam hammer, two of 5 cwt. and one of 3 cwt., two hydraulic wheel presses, drilling machines, plate-bending and punching machines, and a 5-ton crane. The forgers are worked by a blower, and the steam hammers are worked from a small steam boiler-house in which are placed two Cornish steam boilers of 30 horse power each, and one French boiler of 20 horse power. These also supply steam to the stationary engine which works the machinery in the different shops.

The carriage and wagon shop occupy an area of 6,300 square metres. All the machinery in this shop is worked by a 40-horse power compound engine, and the principal machinery consists of four wheel turning lathes, two planing machines, one tube cutting and screwing machine, one slotting machine, three drilling machines, one machine for bending corrugated iron plates, one dynamo and complete electro-plating apparatus, and one general testing machine to test up to 500 atmospheres. In this department all the wood working for carriage repairs is carried on.

Two first class passenger cars were in course of construction during the visit when this information was obtained. They were designed at Tolisa, and are wood framed, and stand upon two six-wheeled bogies, and measure 58 feet 1 inch over the body, and are divided up into two private compartments, a general saloon and w.c., and have a total capacity for 62 first-class passengers. The majority of the wood employed in their construction is grown in the country. Although solidly constructed they are not heavy. The inside fittings are most luxurious, and almost too good for the rough treatment railway carriages receive at the hands of the public. An adjunct of these shops is a saw mill fitted with the following machinery: one self-acting bandsaw for large logs, four slotting machines, three bandsaws, three planing and moulding machines, two circular saws, one planing, tongeing and grooving machine, one planing machine, two wood turning lathes, and one saw-sharpening machine, all of which is driven by a horizontal steam engine of 50 horse-power.

Other adjuncts are a commodious paint shop, a "running shed," storerooms and administration offices. All the buildings are illuminated with electric lights, the current for which is supplied by the River Plate Electricity Company from their La Plata station. There is a very efficient water service throughout the yard and shops, and in case of a fire two portable fire engines with hose carts and all accessories are at hand; these are worked by a fire brigade formed by the workmen.

The *Ferro Carril Oeste* is the oldest railroad in South America, its construction having begun in 1853. A relic of these early times is still preserved in these shops at Tolosa. It is the first locomotive that ever run in South America, named "La Porteña," meaning The Belle of the Porte. This engine was illustrated for the first and only time in a North American paper by the NATIONAL CAR AND LOCOMOTIVE BUILDER, in its issue for June, 1892. After over 30 years of service it was put in the best condition possible for preservation. Another Argentine locomotive of special interest is that shown in the engraving herewith, which was reproduced from a photograph taken for the NATIONAL CAR AND LOCOMOTIVE BUILDER by our Argentine correspondent. It is the first locomotive ever built in the Argentine Republic or in South America. It was built in Buenos Ayres for the *Ferro Carril Oeste* in 1885. It was intended for local passenger service, but after a few years it was relegated to work train service, in which it is now employed. The cylinders are 15 inches by 20 inches. The driving wheels are 59 inches in diameter. The boiler carries 120 pounds steam pressure and has 131 tubes 11½ inches long and 2 inches in diameter. The weight of the engine and tender ready for the road is 40 tons. The engine was built complete at Buenos Ayres, with the exception of the wheels, which were imported from England.



First Locomotive Built in South America.

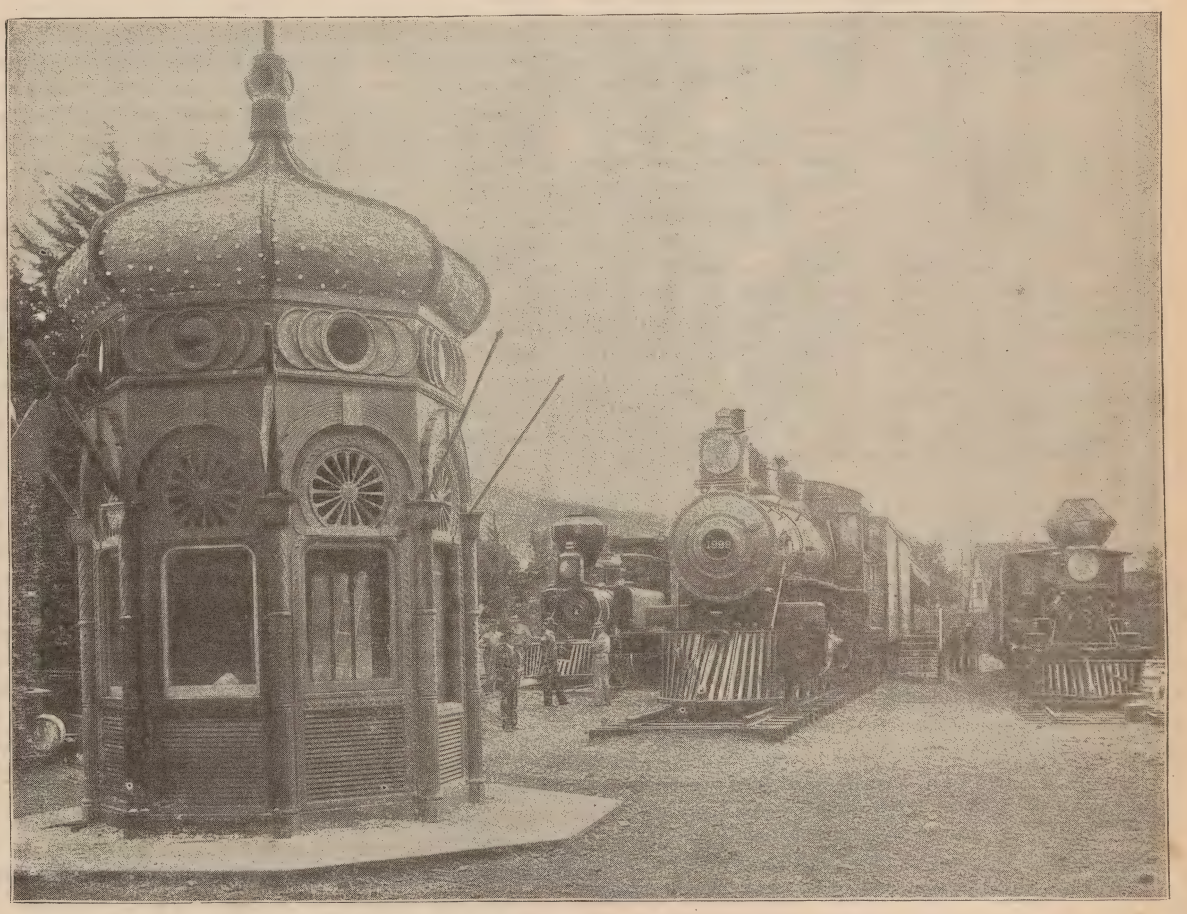
This railroad has recently put in service two new compound freight locomotives of the Worsdell-Von Borries system, built by Messrs. Beyer, Peacock & Co., of Manchester. Their cost in England was £2,550. The engines have extended smoke-boxes and head lights and pilots, and present quite an Americanized appearance. The low pressure cylinders are 24½ inches by 24 inches, and the high-pressure cylinders are 17 inches by 24 inches. The driving wheels are 5½ feet in diameter and the truck wheels are 3 feet 5½ inches in diameter. The engines weigh 44½ tons when ready for the road.

Southern Pacific Railroad Exhibit at the California Midwinter Fair.

Through the courtesy of Mr. Henry J. Small, Superintendent Motive Power and Machinery of the Southern Pacific Railroad, we are enabled to present somewhat tardily a photograph of the locomotive exhibit of that road at the Midwinter Fair held at San Francisco in the fore part of 1894. The photograph was not taken from an advantageous point, as the "Kiosk" looms up in the foreground too prominently and dwarfs the appearance of the locomotive exhibit.

The locomotive on the right is the *C. P. Huntington*, one of the pioneer locomotives of the road. It has one pair of drivers, and its cylinders are 11 inches by 15 inches. It is typical of the first Pacific Coast locomotives. The engine in the center is a Schenectady compound 12-wheel locomotive with cylinders 20 inches and 30 inches by 26 inches. Its number is 1,999. The engine on the left is a logging engine belonging to some outside road. The car just behind the 1,999 is one of the company's large furniture cars. The Southern Pacific also had on exhibition one of its latest Pullman sleepers, a day coach and a small passenger coach—the first one used in California. These are not visible in the photograph.

The contrast between the 1,999 and the pigmies on either side is a graphical illustration of the advance in railroading in California in the last 20 years. It tells of immense growth of traffic and sagacious physical improvements in roadbed and rolling stock to promptly and economically handle the traffic. The implication is not overdrawn, as those who have visited the territory of this great railroad in recent years know very well. It is a splendidly equipped, well managed and efficiently operated railroad. Laboring under the serious disadvantages of a high cost of labor and all supplies (coal averaging over $5 per ton), and of desert and mountainous territory, it yet renders at very reasonable charges a service as nearly perfect as skilled management and modern improvements can provide.



Southern Pacific Locomotive Exhibit at the California Midwinter Fair.

NATIONAL CAR AND LOCOMOTIVE BUILDER

PUBLISHED MONTHLY

BY

R. M. VAN ARSDALE,

MORSE BUILDING..... NEW YORK.

GEORGE H. BAKER, Editor.

JANUARY, 1895.

Subscription.—$2.00 *a year for the United States and Canada; $2.50 a year to Foreign Countries embraced in Universal Postal Union.*

EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING PAGES. *The reading pages will contain only such matter as we consider of interest to our readers.*

Special Notice.—*As the* NATIONAL CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, correspondence, advertisements, etc., intended for insertion must be received not later than the 25th day of each month.*

Contributions.—*Articles relating to railway rolling stock construction and management and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of official changes, and additions of new equipment for the road or the shop by purchase or construction.*

To Subscribers.—*The* NATIONAL CAR AND LOCOMOTIVE BUILDER *is mailed regularly to every subscriber each month. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery, and in case the paper is not then obtained this office should be notified, so that the missing paper may be supplied. When a subscriber changes his address he ought to notify this office at once, so that the paper may be sent to the proper destination.*

A HAPPY NEW YEAR.

The NATIONAL CAR AND LOCOMOTIVE BUILDER extends a hearty New Year's greeting to its readers, and wishes them happiness and increased prosperity. It indulges in the fervent wish that such happiness and increased prosperity may be fleet in their coming, and that all obstacles may vanish from their path.

For a year and a half we have had too much of worry, of striving to make both ends meet, and far too little of general industrial and commercial activity. The great system of inland transportation with which our readers are connected has, as it always does, shown how intimately it is connected with the general business interests of the country, by its sympathetic response to their condition, assuming at once their symptoms of uneasiness and depression. Careful and impartial students of the situation are agreed that the indications are altogether favorable for 1895 being a prosperous year in nearly all branches of industry, and the certain effect of this on railroad traffic and affiliated industries is well known. It is not our purpose to record the history of the old year, for it has been short and its principal events are still fresh in our minds. It has been a year of great trouble generally, and we see it "join the majority" without regret. We turn our faces to the new year, and trust that its promises of improvement may be fully realized.

Attention is called to the standing invitation to contributors at the head of this column, under "Editorial Announcements." People are apt to neglect standing invitations, and we take this occasion to make this invitation a special one to each of our readers, and we wish them to accept it in this spirit. Contributions relating to the construction, management and maintenance of railroad rolling stock are specially desired. Drawings, or prints of same, illustrating new special shop tools, or new appliances for the shop, the office, the car or the locomotive, will be valuable contributions and will be appreciated as such. In sending these our friends will confer an additional favor if they will send also a full description of the device illustrated by the drawing. Information concerning the changes of officers and the contemplated or actual ordering of new equipment of any kind, is much desired.

With its last issue, the NATIONAL CAR AND LOCOMOTIVE BUILDER completed the first quarter of a century of its existence, and with this issue it begins the second quarter of what many of its friends have been pleased to wish may be a full century of useful endeavor. We wish here to thank those who have sent us congratulations on the event, and who have wished continued success to the paper that, as some have said, has long been a friend and companion. In reviewing the career of the paper we have been impressed with the fact that not one of those connected with it at the time of its inception or during its earlier years is now alive. Like the year we have just dismissed, they served their purpose in the world and have passed on. Another quarter of a century and probably none now connected with the paper will have interest in it. Happily, the work and influence for good of a paper of this character does not depend on any one man or set of men. As one actor retires another takes his place, and we trust that each change time effects will result in improvements that will enhance the value of the paper, exalt its tone and make it more interesting to its widely extended circle of readers. To these, at home and in foreign lands, we repeat: A Happy New Year!

LOCOMOTIVE FUEL CONSUMPTION.

We publish on another page a paper on "Locomotive Fuel" read to the last meeting of the Western Railway Club by Mr. William Forsyth, Mechanical Engineer of the Chicago, Burlington & Quincy Railroad. The paper shows how large a proportion of the cost of engine service the expense for fuel is, it averaging 30.7 per cent. of such cost on the C., B. & Q. road during the last ten years. Mr. Forsyth expresses the opinion that considerable saving can be effected by analyzing the coal received from different sources to determine its value as a fuel, and then to avoid the purchase of poor coal. The price of coal is not regulated by the value of its heat-producing qualities, but rather by the cost of mining and transportation. Frequently coal of inferior quality will cost more in the same market than coal of superior quality. Manifestly, the proper course to pursue is to buy the best coal, but which is the best can often only be ascertained by chemical analysis or extended practical tests.

The paper presents a diagram showing the consumption of coal on the C., B. & Q. R. R. for 10 years, based on pounds of coal burned per loaded car-mile. This shows that the consumption has increased one pound per car-mile, or from 5½ to 6½ pounds, 18 per cent., in 10 years. Considering that numerous improvements have been made in locomotives during this time that should improve their economy, this is somewhat discouraging unless we take into consideration the increased duties placed on locomotives during the last 10 years. While it is true that larger boilers and fireboxes, brick arches, etc., have been extensively adopted and are well-known promoters of economy, it is also true that cars are heavier and their loads greater and the speeds of trains faster than 10 years ago. The basis of measurement is at fault. The unit of work is: a loaded car hauled one mile. Considered as a measure of such work done between such widely separated periods of time as 10 years, this is very indefinate. The weight of the car and its load, and the speed at which it is hauled, are very important factors of the problem, but receive little attention. We all know that the increase of speed and load hauled has been considerable in the time named, although it is perhaps impossible to say just how much, although it is possible to say just how much the coal consumption has increased. This is simply a matter of imperfect records. We have increased the work, but do not know how much. Doubtless if it could be accurately measured it would be found that the economical advantages of recent locomotive improvements have been fully realized, and that these engines are doing more economical work now than ever before.

Mr. Forsyth suggests as matters for profitable discussion the questions: What is the best method of showing fuel consumption so as to properly grade the performance of enginemen? and will it pay to keep records in sufficient detail to show what is accomplished? Referring to the diagram of his paper, it will be seen that the coal consumption leaps in 1888 from about 5½ pounds per loaded freight car-mile to 6½ pounds. This is the average consumption for 1888 compared with that for 1887. In 1889 the average consumption drops to less than 6 pounds per car-mile. What was the cause of these great fluctuations? The answer to this question should also answer the question, Will it pay to keep records? The cause of the great increase in coal consumption of C., B. & Q. locomotives in 1888 was bad management by the engineers and firemen. An entirely new set of men operated the engines during this year. Many of the firemen were having their first experience in the occupation, and many of the engineers the same, and all were more or less strangers to the road and unfamiliar with the engines and the fuel. They burned more coal. The cause of the decrease of coal consumption by these engines in 1889 was improved management of the engines by the engineers and firemen, which was altogether the result of the men becoming familiar with the road, the engines and the coal, and of their being judiciously instructed in economical methods of firing and running the engines. If the millions of car-miles made on this road in the years named are taken into consideration, then the effects of management on locomotive coal consumption will be measured. It would probably be found that in 1888 the increased coal consumption due to mismanagement cost the company about $200,000; and that the decreased consumption in 1889 due to improved management saved about $100,000. It seems that, in a matter capable of increasing or decreasing so largely the net earnings of a railroad, it will certainly pay to keep an accurate record of what is being done, not only as a means of comparison, but chiefly as a means of keeping up the interest and zeal of the enginemen in doing good work.

CONCERNING A RECENT BOILER EXPLOSION.

Under the above heading the *Railroad Gazette* in its issue of Dec. 21 treats its readers to one of its usual learned dissertations on locomotive matters. It starts out as follows:

A contemporary, commenting on the causes of a locomotive boiler explosion, says that it is supposed that "when the engineer opened the injector, water covered the crown sheet, which, being at a very high temperature, completely vaporized the water, thus causing the explosion of the boiler. This is the most probable version of the cause which produced the catastrophe." After the explosion it was found that the crown sheet had been hot. Just how the complete vaporization of the water in the boiler can cause an explosion is not explained. Most people think that a boiler has its principal function in vaporizing water completely into steam; if not, then what is the boiler for? It was probably intended to say that the water was suddenly made into steam and caused the explosion, as that is an old theory still held by some, although long since proved to be fallacious.

The contemporary mentioned is the NATIONAL CAR AND LOCOMOTIVE BUILDER, and the article referred to was that appearing on page 188 of our last issue, entitled "Explosion of an English Built Locomotive in the Argentine Republic." The statement quoted by the *Railroad Gazette* and forming the text of its sermon is not, as the writer must have known very well, a comment of this paper on the explosion, but a part of the account translated from the Spanish sent us by an Argentine railroad officer, and distinctly and prominently stated to be such. We allowed the statement to pass unchallenged because we considered it quite harmless. The possibility of a boiler being exploded by the small amount of steam that can be generated by the heat contained in a red-hot crownsheet has long ago been settled negatively in the minds of well-informed mechanics. The NATIONAL CAR AND LOCOMOTIVE BUILDER has frequently expatiated on this and other supposed causes of locomotive boiler explosions, and has shown that such explosions are due to well-understood and easily controlled circumstances. The cause of explosion with an overheated crownsheet is simply due to the weakening of the sheet, its giving down and permitting the sudden escape of a large quantity of the contents within the boiler, this in turn permitting the formation with explosive violence of sufficient steam to rend the boiler. The same thing happens occasionally in collisions when the dome is torn loose from the barrel of the boiler, or when a large aperture is made in the boiler in some other way. This sudden formation of steam is due to the equally sudden decrease of pressure in the boiler following the escape of a considerable portion of its contents, and its explosive violence is due to the large store of heat contained in the water in the boiler.

POWDERED COAL.

Probably the most economical way to burn coal for steam production is in the powdered condition. In this state it can be blown into the furnace with nearly exactly the needed amount of air, and as the powder and air are thoroughly mixed before entering the furnace, instant and complete combustion follows. Comparative tests of the fuel value of lump and powdered coal have frequently shown as high as 20 per cent. economy in favor of the latter. Machines for breaking coal at the mines into pieces suitable for burning have long been used. Some railroads find it advantageous to have some grades of refractory coal thus crushed at the mine, to save firemen exhausting and time consuming labor. These not only make the fireman's duties lighter, but, with such coal, accomplishes economy of fuel through improved combustion, and insures a more steady and adequate steam supply. Machines have now been perfected for grinding coal into powder at the cost of but a few cents per ton. As locomotives are at present arranged and operated there is small chance for the successful use of powdered fuel in that service, but in stationary engineering its use is extending gradually.

To meet the possible demands of the general adoption of powdered coal as fuel some genius has devised a scheme to powder and wash the coal at the mines and mix it with about 50 per cent. of water, and pump it to the required destination through a line of pipes, where it would be deposited in settling basins and the water drawn off in due time. Being washed of most of its impurities and incombustible matter, consisting mostly of dirt, rock, slate and sulphurets of iron, it is claimed that coal so treated would contain but about 3 per cent. of ash, and could be transported for about one-tenth the cost of the usual means. As washing and grinding machines would have to be established at the mines, and as expensive lines of pipes would have to be laid, and pumping-engines established every 30 or 40 miles, besides the terminal facilities mentioned, it is evident that this means of transporting coal is not for the present. But it does not appear that it would be impractible if a sufficient number of steam engines throughout the country used powdered coal, or even a sufficient number in any one of the large cities. It is simply a matter of conjecture how fast the use of powdered coal will extend. The demands of economy generally, and of the suppression of smoke in cities particularly, may possibly prove potent in this direction.

Referring to the wider use of tank cars, mentioned in a recent issue, it is now said that, in addition to the use of these cars for the wine traffic in France and the molasses traffic in the South, they are also used for the transportation of whisky in Austria.

Thomas Lloyd, an engineer employed at the Stevens colliery in West Pittson, Pa., deserves honorable mention as a hero. On the night of Dec. 15 the engine-house took fire and burned rapidly. There were 46 men in the mine. To reach them the engineer, like "Jim Bludso," "stuck to his post till the last galoot was ashore," although hemmed in by the fire and so severely burned that he lost consciousness as soon as his heroic task was finished.

It is said that owing to the altitude it is almost impossible to boil potatoes in the City of Mexico. The city is about 7,400 feet above sea level, and the pressure of the air at this altitude is so light that the water boils at such a low temperature that it is hardly sufficient to cook the nutritious vegetable named. This is interesting, not only in reference to potatoes, but also to locomotive boilers, and gives an impressive idea of the variation of temperature that invariably accompanies the pressure on boiling water.

At Deadwood, S. D., the train and engine men of the Burlington & Missouri River Railroad have established a reading-room for their convenience and instruction while in Deadwood. Night school is held in the reading-room twice a week. This is conducted by Mr. M. E. Wells, the General Foreman of the B. & M. at Deadwood. Mr. Wells is a bright young man with a very good education, who took up locomotive engineering during the Burlington strike in 1888. He has been Foreman at Deadwood for about four years, and has always interested himself in having the enginemen running into Deadwood well instructed in the science of their occupation. As a result he has a very efficient set of men. The reading-rooms are in need of literature, and those who have books that they wish to donate should send them to Mr. Wells.

The last obstacle to competition in the telephone service was removed by the decision of Judge Carpenter, of the United States Circuit Court, at Boston, Dec. 18, declaring void the patent issued in Nov., 1891, to Emile Berliner for a system or combination of a transmitter and receiver for a speaking telephone that is identical to the expired patent granted in November, 1880, and that has constituted the monopoly of the telephone business enjoyed by the American Bell Telephone Company. It is held by the court that the Bell Telephone Company connived at the delay of issuing the new patent over a long series of years in order that its monoply of the business might be prolonged.

While the telephone service enjoyed by the public since telephones came into general use has been a great convenience and time saver, it will yet be a matter of general satisfaction that the monopoly of the business is soon to be broken. Competitors in the field will receive prompt support from many who have long fretted at the exorbitant prices charged and the frequently wretched service given by the Bell Telephone Company. That competition will have the immediate effect of lessening the charges and improving the service is beyond doubt.

Literature.

The report of the 25th annual convention of the Master Car and Locomotive Painters' Association has been issued, bound in cloth. It is published by the *Railroad Car Journal*, New York.

The second volume of the Standard Dictionary, published by the Funk & Wagnalls Company, of New York, is now ready for distribution, as is also the one-volume edition. An extended description of this work was published in our October issue.

Mr. O. J. Edwards, of Ellwood City, Pa., has published a pamphlet which gives accurate tables of information relating to cold drawn seamless steel tubing. They give internal diameters, internal and external areas, area of cross section of metal, and weight in pounds per foot and inch. The price is 50 cents per copy.

Modern Progress.—This is the name of a paper the first number of which was recently issued. Perhaps an idea of its character and aim can best be conveyed by quoting the paragraph in which it introduces itself:

"By the application of perfected inventions modern progress has been achieved. *Modern Progress* will chronicle the success of perfected and applied inventions."

The first issue contains 26 pages (6 by 13 inches) of reading and illustrative matter. It is published by the Modern Progress Company, Erie, Pa., and the subscription price is $2 per year.

Painting and Decorating begins its tenth volume, in a new and enlarged form. It has long been a good publication, being well printed and presenting in each issue much original matter and up to date news of interest to painters and decorators, and those connected with allied industries. The enterprise that prompts improvement is always commendable, and when it is undertaken in such times as these it is deserving of special notice. The new size of page adopted by *Painting and Decorating* is 7 by 11 inches. This will enable the satisfactory reproduction of numerous designs helpful to painters. The paper is published monthly by the Trade News Publishing Co., of 247 Broadway, New York.

The Uses of Compressed Air. By Addison C. Rand. Published by Republic Press, 14 Lafayette Place, New York. Price, $1.

This is a small book, 131 pages, on a very large subject; so, of course, it does not go into detail extensively, but it discusses in a general way the uses of compressed air for many different purposes. It is bound in cloth and is well illustrated and printed, and will prove interesting and instructive to those who wish to learn in how many different ways the very useful medium of which it treats has been turned to the uses of man in the industrial arts.

Poor's Directory of Railway Officials, and Manual of American Street Railways. 1894. Price, $3. R. V. & H. W. Poor, 70 Wall street, New York.

This is the ninth annual number of this excellent publication. It contains a complete directory of American rail road officials, and its information is groupled in ways that make it very convenient for a number of purposes. Besides this there is a directory of Mexican, Central American and South American railroads and their officers; and an index of railway and affiliated industries, the latter being a reliable and comprehensive guide for buyers, as it names the principal makers of and dealers in railroad supplies of all kinds.

The Magazine of Travel.—Monthly. Illustrated. $3 per year. The Magazine of Travel Publishing Company. 10 Astor Place, New York.

This is a new magazine, the first number of which has just been issued. It is edited by Mr. E. H. Talbott, who is also President of the publishing company. Mr. Talbott is well and favorably known to railroad men through his former connection with the *Railway Age*, of which paper he was for many years proprietor and editor. The successful record of that paper under his management stands as an assurance of the success of *The Magazine of Travel*, the first number of which is replete with interesting accounts of travel and good illustrations, and which in typography and general make-up is first-class in every particular.

The present number contains an article by Chauncey M. Depew on "American and Foreign Travel Compared"; one by E. H. Talbott on "Mexico: Its Attractions for the Tourist"; "The New Education," by Edwin Fowler, M. D.; "A Summer in Alaskan Waters," by William G. Cutler, Lieut. U. S. Navy; "Christmas on the Limited," by Frank Chaffee; "The Mountain Paradise of Virginia," by Chas. D. Lanier; "Hunting in the Cattle Country," by Theo. Roosevelt; "In Southern California," by George M. Allen.

The above gives an idea of the scope of the field this magazine intends to cover. Travel is a great educator, and accounts of travel are likewise a valuable means of both education and entertainment to all. In serving these useful purposes we wish for *The Magazine of Travel* all possible success.

The Southern and Southwestern Railway Club.

The next meeting of The Southern and Southwestern Railway Club will take place at the Kimball House, Atlanta, Ga., on Thursday, January 17, 1895, at 10 o'clock a. m. The subjects for discussion will be:

1st. What is the cause of uneven wear of driving wheel tires running in the southwestern territory? Messrs. Wm. Rutherford, P. H. Schrieber, W. H. Hudson, committee.

2d. What is the most economical method of obtaining compressed air for general use in railroad shops, and its application? Messrs. E. M. Roberts, T. W. Gentry, John S. Cook, committee.

3d. Discussion of the report on counterbalancing of driving wheels.

4th. Additional report of committee on draft sheets and discussion of the subject.

5th. What is the most economical tonnage spring—the elliptic, half-elliptic, or the coil, considering the first cost, and the duration of efficiency of each—and its effect on the rolling stock and track? Messrs. R. P. C. Sanderson, Geo. W. Morris, S. A. Charpiot, committee.

The following committee has been appointed on Revision of M. C. B. Rules: Chairman R. D. Wade, R. P. C. Sanderson, A. G. Steinbrenner, Pulaski Leeds, Jas. Cullen, J. M. Holt and S. A. Charpiot.

As a result of the completion of the Burlington & Missouri River road to Billings, Mont., where it connects with the Northern Pacific, a new route has been opened through Montana and Idaho to the Pacific Coast by the Burlington. The line saves 295 miles between Omaha and Helena, 225 miles between Omaha and Butte, and 385 miles between Omaha and Spokane. A through train service has been established with Pullman sleeping cars and reclining chairs, and in a trip on the new line the traveler can have every convenience and see some of the finest scenery on the continent.

A society has been recently established in Chicago entitled "Association of Practical Electricians." The object of this organization, of which Mr. George E. Sanford is president, is the education and advancement of men engaged in electrical work.

The Little Rock & Pacific Railroad Company was incorporated Nov. 26. The capital stock is $4,600,000, and the road is to run from Little Rock to Wister Junction, I. T., where it will connect with the St. Louis & San Francisco road.

A considerable amount of coal is now being produced in the State of Washington. The great handicap of enterprises on the Pacific Coast has been the lack of a local coal supply. For many years coal has been shipped to this coast from Australia and England, and could compete in price with coal shipped from states east of the Rocky Mountains. The rail haulage of the latter was always and continues very expensive. The Fair Haven Coal Company, whose mines are near Sedro, Wash., is now supplying the Great Northern Railroad with 1,500 tons per month, and coal from its mines is being used as far east as Leavenworth, Wash. This is some encouragement to the hope that before many years the need of coal on the Pacific Coast may be supplied much more largely than at present by local mines.

The Electric Storage Battery Company, of Philadelphia, has acquired all the rights, patents, etc., of the Consolidated Electric Storage Company; the Brush Electric Company, of Cleveland; that branch of the business of the General Electric Company; all the property, patents, etc., of the General Electric Launch Company and the Electric Launch and Navigation Company, and the licenses and patents of the Accumulator Company. The completion of these purchases virtually places in control of the Electric Storage Battery Company all the business of supplying storage batteries, and puts an end to litigation over patent rights.

All Pennsylvania railroad lines east of Pittsburg and Erie for November, 1894, as compared with the same month in 1893, show: An increase in gross earnings of $177,704.77; a decrease in expenses of $33,719.96; an increase in net earnings of $211,424.73. All lines west of Pittsburg and Erie for November, 1894, as compared with the same month in 1893, show: An increase in gross earnings of $287,763.24; a decrease in expenses of $91,093.67; an increase in net earnings of $378,856.91.

Probably the most serious collision between street cars that ever occurred happened at Chicago, Dec. 11, when a cable train on the West Side road lost its grip on the cable while descending the sharp grade of the tunnel beneath the river. The brakes failed to control the speed of the train, and it collided with great force with the preceding train at the foot of the grade, injuring 12 people very seriously, two fatally, and wrecking several cars.

A Texas & Pacific passenger train was stopped and robbed within 20 miles of Fort Worth, Tex., Dec. 6, by unmasked men. The amount said to have been taken from the express safe was $140,000 in money, checks and gold bullion. An account of the robbery says that "after the holdup the robbers mounted their horses, told the engineer to go on and then made leisurely off in a northwesterly direction."

The Baldwin Locomotive Works have presented the engineering laboratory of Purdue University a pair of Vauclain compound locomotive engines, with cylinders 9½ inches and 16 inches in diameter, by 18 inch stroke. They will be supplied with steam from the laboratory boilers, and are designed for an experimental study of this type of compound engine.

A broken rail wrecked an eastbound passenger train on the Atlantic & Pacific road near Ash Fork, Ariz., Dec. 24. The entire train left the track. The day coach was turned upside down, and the tourist car was thrown 30 feet from the roadbed. Several passengers were painfully bruised.

The New York Central & Hudson River Railroad directors met Dec. 27, and declared a quarterly dividend of 1¼ per cent. The report for the quarter ending Dec. 31 is a favorable exhibit, showing an increase in the surplus of $128,147, an increase of $51,188 over the same period last year.

The Falls Hollow Staybolt Company, manufacturing the well-known mandrel-rolled hollow staybolt iron, reports a number of large orders received recently from the important locomotive builders and railroad companies for its safety hollow staybolts.

The Montreal shops of the Canadian Pacific have recently increased their working force by the employment of 300 more men. It is intended to build a number of freight and baggage cars at these shops, and to make needed repairs to a large number of cars.

Oscar Rogers was sentenced to be hung by the District Court of Pinal County, Ariz., Dec. 14, for complicity in the Southern Pacific train robbery near Maricopa. The date of execution is set for Feb. 8. Arizona knows how to treat train robbers.

The Louistown & Auburn Street Railroad Company has ordered a 100 horse-power electric locomotive of the Taunton Locomotive Works. It will be used to clear the track and haul snow cars to clean the streets after snowstorms.

Some Baltimore & Ohio enginemen have been arrested at Pittsburg for burning bituminous coal in locomotives, contrary to a city ordinance forbidding such use. The road will contest the validity of the law in the courts.

A lunch car is being run on the Lehigh Valley Railroad. The car is 70 feet in length, and fitted up with one long lunch counter. Steam from the engine does the cooking, and first-class food is served at a moderate cost.

A head-end collision of two freight trains occurred on the "Big Four" road Christmas morning, near Lafayette, Ind., in which both engines were wrecked and two men were killed. Several men were injured.

Owing to the recent frequent train robberies in the Indian Territory, the Iron Mountain road, beginning Dec. 9, discontinued running passenger trains in that territory at night.

The wages of the employees of the Chesapeake, Ohio & Southwestern have been ordered increased to what they were previous to the cut of 10 per cent. made some time ago.

The Baltimore & Ohio is building new shops and what is to be the largest roundhouse on the system, at South Cumberland, Md.

Two coal trains collided on the Lehigh Valley R. R., at Neshanic, N. J., Dec. 4, wrecking 20 cars and a locomotive.

Personal.

Mr. E. T. Carlton has been appointed Master Car Builder of the Elgin, Joliet & Eastern.

Mr. Amos Green, General Manager of the Quincy, Omaha & Kansas City Railroad, has resigned.

Mr. John F. Flourney has been appointed Receiver of the Georgia Midland & Gulf Railroad in Georgia.

Mr. Frank S. Gannon has been appointed General Manager of the Staten Island Rapid Transit Railroad.

Mr. F. B. Drake, of Toledo, O., has been appointed Receiver of the Cincinnati, Jackson & Mackinaw Railroad.

Mr. G. Clinton Gardner, who has been General Manager of the Ohio River Railroad since April, 1892, has resigned.

Mr. John Horrigan has been appointed Master Mechanic of the Elgin, Joliet & Eastern, vice J. F. Sechler, resigned.

Mr. W. B. Thomas, General Manager of the Augusta Southern, has been appointed Receiver of the Atlanta & Florida.

Mr. T. W. Ford has been appointed General Manager of the La Porte, Houston & Northern, with headquarters at La Porte, Tex.

Mr. John F. Miller, General Superintendent of the Pennsylvania-Southwestern system, has fully recovered from his recent illness.

Mr. R. E. Eavenson has been appointed General Manager of the Williamsport & North Branch, succeeding Mr. Benjamin G. Welch.

Mr. Z. D. Lancaster has been chosen President and General Manager of the Sebasticook & Moosehead, in place of Mr. Wesley Van Wart. General offices, Hartland, Me.

Mr. J. L. Butman, of Saratoga, N. Y., who recently leased the Delaware River & Lancaster, is now General Manager of that road, with headquarters at St. Peter's, Pa.

Mr. Charles Foster, formerly Master Mechanic of the Fremont, Elkton & Missouri Valley, died at Missouri Valley, Ia., Dec. 7. He had been in poor health for several years past.

Mr. E. V. Sedgwick, formerly Master Mechanic of the Mexican Central, has been appointed Superintendent of Motive Power of the Interoceanic Railroad, with headquarters at City of Mexico.

Mr. E. St. John, General Manager of the Chicago, Rock Island & Pacific, has resigned that position, and has succeeded Mr. John C. Winder as Vice-President and General Manager of the Seaboard Air Line.

Mr. W. H. Truesdale, Third Vice-President of the Chicago, Rock Island & Pacific, has assumed the duties of General Manager of the road, in addition to his other duties, succeeding Mr. E. St. John, resigned.

Mr. M. F. Bonzano, who was for seven years Division and General Superintendent of the Philadelphia & Reading, has been made Assistant Manager of the South Jersey Railroad Company, with headquarters at Cape May, N. J.

Mr. Amos R. Barrett, Superintendent of Motive Power of the Boston & Maine, has resigned on account of ill health, and is succeeded by Mr. Henry Bartlett, formerly Assistant Engineer of Motive Power of the Pennsylvania Railroad at Altoona.

Mr. W. F. Bradley has been appointed General Superintendent of the Toledo, Ann Arbor & North Michigan Railroad. Mr. Bradley has been Superintendent of Motive Power of the road for about three years, and was previously Master Mechanic for about a year. He will remain in charge of the mechanical department.

Mr. W. H. Fenner, Jr., well known to railroad and supply men from his former connection with the Rhode Island Locomotive Works and the Allen Paper Car Wheel Company, has been elected President of the National Car Wheel Company, at Buffalo, and Mr. W. W. Turlay, of the same city, who has acted as Manager of the company since its organization two years ago, has been elected Vice-President and Treasurer.

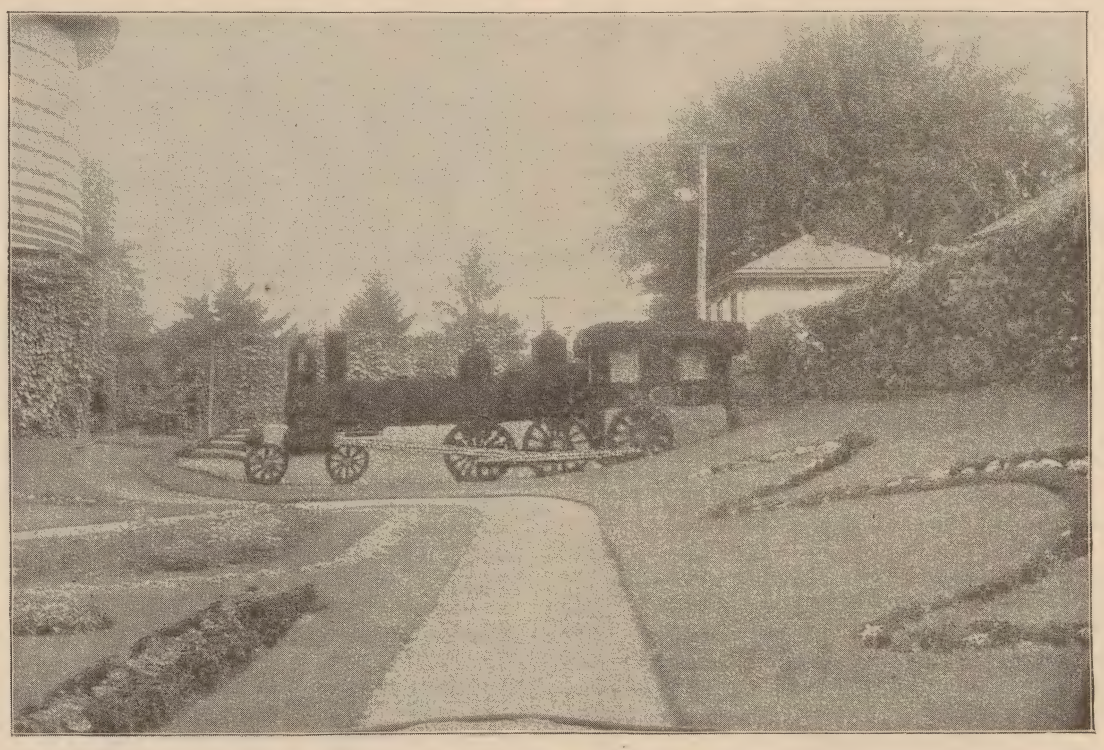
Mr. William Smith, Superintendent of Motive Power of the Chicago & Northwestern, has resigned, and is succeeded by Mr. Robert Quayle, Master Mechanic of the Northern Division of the same road. Mr. Smith has been in the service of the Chicago & Northwestern for the past 21 years. His entire railroad service has been on that road, in the mechanical department of which he worked his way up from a machinist in 1873 to Superintendent of Motive Power in 1890.

Mr. John King, for the past 10 years president of the New York, Lake Erie & Western, has resigned on account of ill health. Mr. King was born on the same day that the Erie road was chartered, 63 years ago. Mr. E. B. Thomas, the Second Vice-President of the company, has been elected President to succeed Mr. King. Mr. Thomas was born in Cleveland, O., 53 years ago. His railroad experience covers 25 years, and he is generally highly esteemed for his exceptional abilities as a railroad manager.

Mr. C. H. Quereau, who for over four years has been Engineer of Tests of the Chicago, Burlington & Quincy R. R., with headquarters at Aurora, Ill., has been appointed General Foreman at Plattsmouth, Neb., to attend to such duties and special investigations as may be assigned him by Mr. D. Hawksworth, Superintendent of Motive Power of the Burlington & Missouri River R. R. Mr. Quereau is one of the most industrious and intelligent students of rolling stock problems in the American railway service, and his addition to the motive power force of the "B. & M." will certainly prove a valuable acquisition.

Col. S. Palmer, Superintendent of Construction of the Western Union Telegraph Company, and the oldest telegraph line builder in the world, died Christmas Eve at his home in St. Louis, aged 72 years. Colonel Palmer was one of the pioneers in telegraph construction. He built the first line out of New York in 1845. He was connected with the Western Union about 40 years, building most of its lines in the West. He put the lines along every railroad in St. Louis. During the war he constructed lines for the Government. He was active in the business up to the beginning of his illness, four or five months ago.

Mr. L. E. Johnson has been appointed Superintendent of the Michigan division of the Lake Shore & Michigan Southern, with headquarters at Toledo, O., to succeed Mr. T. F. Whittlesey. Mr. Johnson was formerly Superintendent of the Chicago division of the Chicago, Burlington & Quincy Railroad, and previously was Master Mechanic of that division. He worked his way up through the Chicago, Burlington & Quincy mechanical department from being a locomotive engineer to being superintendent of the most important division of the road. He is, therefore, a thoroughly experienced railroad man, and he is a very capable, courteous and efficient officer.



Floral Locomotive, Michigan Central Railroad.

Mr. John N. Reynolds, who for the past 15 years has been connected with the NATIONAL CAR AND LOCOMOTIVE BUILDER, as manager of its advertising department, has resigned that position to accept a somewhat similar position with the *Railroad Gazette*. He will represent the *Railroad Gazette* at Chicago, and will have his office in the Rookery Building. Mr. Reynolds is widely known among manufacturers of railroad supplies of all kinds, through his connection with this paper. He is a gentleman possessing many honorable and admirable qualities that make business relations with him very pleasant. In his new field of work the NATIONAL CAR AND LOCOMOTIVE BUILDER wishes him unlimited success.

Mr. Robert Quayle, the newly appointed Superintendent of Motive Power of the Chicago & Northwestern, was born in Duglas, on the Isle of Man, in 1853. He received his early education in the Chicago public schools. He began railroad work in 1871 as an apprentice in the Chicago & Northwestern shops at Chicago. He rose through the usual grades of promotion in the mechanical department of this road until in 1885 he became Master Mechanic of the Iowa and Northern Iowa divisions. He became Master Mechanic of the Milwaukee, Lake Shore & Western in 1891, and held the position until the road was absorbed by the Chicago & Northwestern, where he continued as Master Mechanic of the same territory, which became the Ashland division of the C. & N. W. Mr. Quayle is well known to the members of the Master Mechanics' Association as a careful student of problems of locomotive economy.

Mr. W. H. Selby died on his farm near Moberly, Mo., Dec. 5. Mr. Selby was appointed Superintendent of Motive Power of the St. Louis, Kansas City & Northern Railway (now Wabash) in 1874. His title was changed to Division Master Mechanic of Western division at the time the Wabash and St. L., K. C. & N. railways were consolidated in 1880. He remained in this capacity until April, 1885, when he retired. Prior to the time he was promoted to Superintendent of Motive Power, he was General Foreman of shops at St. Charles and Moberly. Some time after leaving the Wabash, he was appointed Superintendent of Motive Power of the Omaha & St. Louis Railway, after which he went to the "Cotton Belt" in the same capacity, at Pine Bluff, Ark. After leaving that road in 1889, he was appointed Master Mechanic of the Chicago & Erie at Huntington, Ind., where he remained about 1½ years when he retired permanently from railroad service and located on his farm near Moberly. He leaves his family in good circumstances. He was 62 years old at the time of his death.

A Floral Locomotive.

If any one wants to learn of the refinements of railroad management we do not know of a more profitable road for him to go to than the Michigan Central. From the time that this road had the Falls of Niagara made for the delectation of its patrons, the aim of its management seems to have been to provide all manner of delights for the traveler. Nothing seems to be too great and nothing too small to receive the solicitous attention of this thoughtful management, when the great or small thing involves the comfort, convenience or pleasure of a passenger. Beginning at the foundation of all else, the roadbed is unexcelled in stability and smoothness. From this throughout the whole course the service is excellent—smooth riding, commodious cars, comfortable seats, polite trainmen, good meals and a minimum of small annoyances, such as smoke, dust and cinders, and disagreeable sounds from the locomotives. Smoke is largely prevented by the use of a smokeless coal happily convenient to the road; and the locomotives are provided with whistles the tone of which is pleasant to the sense of hearing.

The pleasing effect of flowers has naturally not been overlooked by so thoughtful a management. At some of its stations landscape gardening is seen in the most advanced stage in summer, and the hot-houses at some of such stations are generally able to provide a pretty bouquet for every lady passenger in summer or winter. The accompanying illustration shows one of the productions of the gardener's art at Ypsilanti, Mich. It is a locomotive that is independent of the motive power department. Its mileage is not excessive, but neither is its cost of maintenance. It is light on fuel, but requires a liberal supply of water. Fortunately, as will be noticed, such a supply is always at hand in the tank a short distance in front of the engine. The preservation of all locomotives requires watchful care of their water supply, and this one is not an exception in this respect; in fact, shortness of water would prove quite as destructive to it as to any engine we know of. This is because the locomotive is constructed principally of the following named materials:

Boiler.....*Alternanthera Spathulata*
Wheels.....*Alternanthera Spathulata*, with *Sedum Variegatum* between wheels and spokes of wheels
Rods.....*Echeveria Metallica*
Bell.....*Alternanthera Aurea Nana*
Whistle.....*Colius Compacta*
Headlight.....*Sedum Variegatum*
Cab.....*Alternanthera Versicolor*
Roof of cab.....*Achyranthus Lindenii*
Windows of cab.....*Echeveria Secunda Gloca*
Cowcatcher.....*Alternanthera Versicolor* and *Sedum Variegatum*

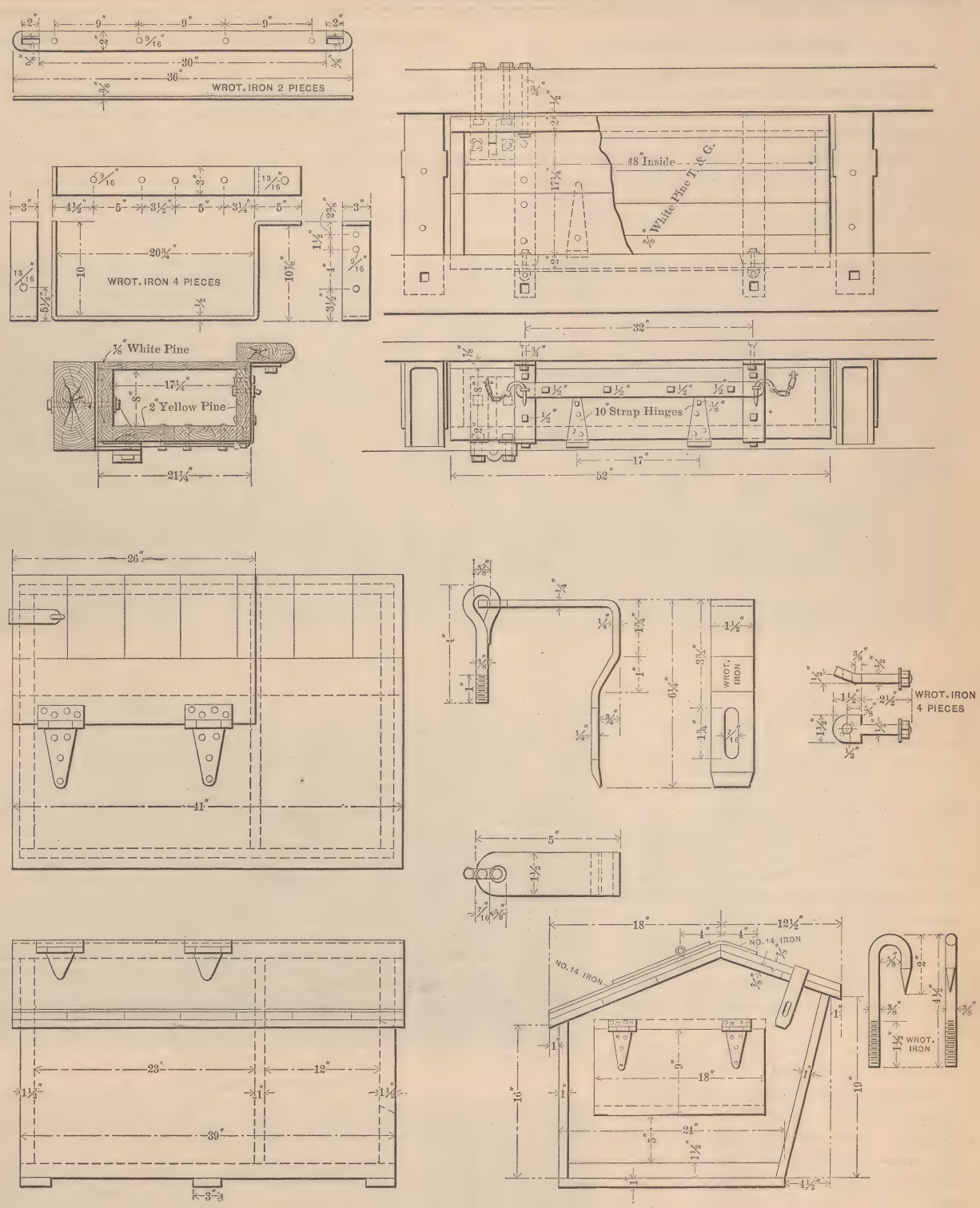
Fewness of parts cannot be said to have received much attention by the builders of this engine, as we are informed that over 2,300 separate pieces (plants) have entered into its construction. However, it is considered a very efficient piece of workmanship, and it performs very satisfactorily the service for which it was designed—to interest and please travelers over the Michigan Central Railroad.

Improved Locomotive Tender, Wabash Railroad.

The illustrations on this page show an improved form of tender adopted as standard on the Wabash Railroad, and designed by Mr. J. B. Barnes, Superintendent Motive Power and Machinery, of the road. In our issue of September, 1892, we illustrated an earlier form of this tender. Two years of service naturally suggested some improvements, and these are embodied in the drawings on this page. The tank is made of wrought-iron, and very strongly constructed, as can be seen. The object of the design is to furnish a hopper-shaped coal pit that will cause all the coal in the tender to flow, in obedience to gravity, to the coal gate and within easy reach of the fireman. This increases the capacity of the tank for water, and avoids hauling around a couple of tons of useless dead weight in the shape of coal at the back of the pit. As is well known it is the general practice of firemen to leave the coal in the back of the pit severely alone. This causes deterioration of both the coal and the metal sheets in contact with it. These expensive results are obviated by Mr. Barnes' improved design, which we understand he has neither patented nor intends to. Therefore everybody is at liberty to avail themselves of its advantages, which have been found to be numerous and valuable in actual service. In addition to the advantages named above, this arrangement lightens the fireman's work—his coal is always handy, and it prevents the overloading of the tender with coal, and the useless spilling of the coal about the chutes and along the roadbed for the next 20 miles, because the object of overloading the tender —to have the coal handy—is satisfied in a more intelligent way by the action given the coal in the hopper. We really consider this form of tender to be the greatest improvement that has been made in locomotive tenders since the adoption of the present form. It fulfills perfectly all the desired objects of a tender, and if coal-burning locomotives are continued in use for many years longer, this design or some modification of it will surely be generally adopted for tenders.

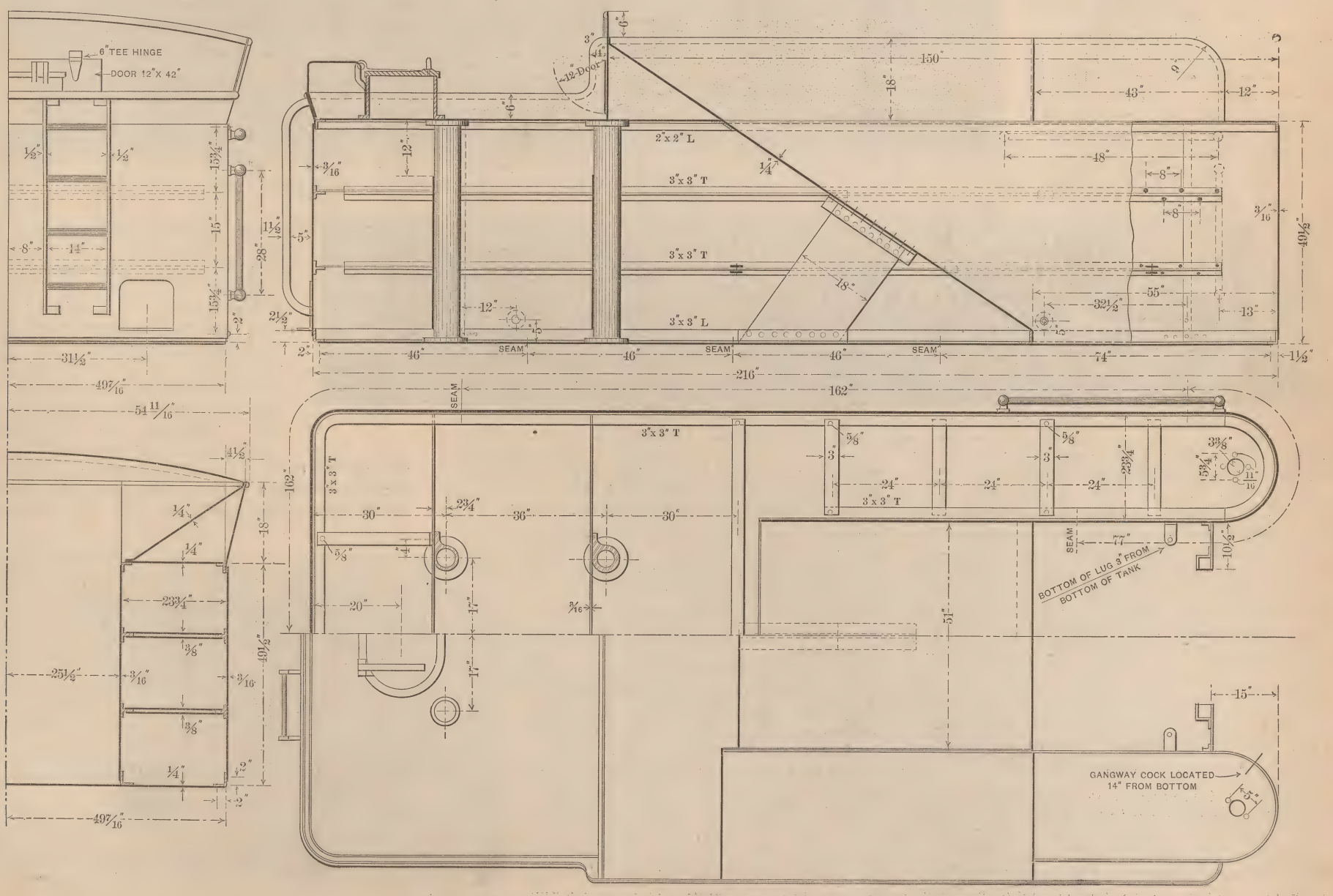
As first constructed, the tool and supply boxes on these tenders were made of iron, but it has been found that wooden boxes are more desirable, and our drawings show the improved form of these that has been adopted. The side boxes are divided into two sections, one of 12 inches and one of 23 inches, separated by an inch board. The small section is at the front and has a very convenient flap door that renders access to it easy. Oil and waste and such tools as are in frequent use are carried in these compartments.

We have devoted our space principally to describing the advantages of this design of tender, and have said little of its construction. This is so simple, and so plainly shown in the drawings, however, that description is unnecessary.



Side and Rear Tender Boxes, Wabash Railroad.

At the meeting of the New England Railroad Club, held in Boston, Nov. 14, Mr. W. W. Snow read an account of a recent visit to Norway, which proved highly interesting and entertaining to the those present.



Improved Standard Locomotive Tender, Wabash Railroad.

Communications.

The National Convention of Manufacturers.

Editor National Car and Locomotive Builder:

It is with great pleasure that the Committee of Arrangements announces assured success and a large representative attendance promised for the National Convention of Manufacturers, which will be held in Cincinnati, January 22, 1895. This result is largely due to the generous and unreserved support which has been accorded to the movement by industrial periodicals of the country and the press at large. The committee desires to thank you specifically for the words of good cheer which have appeared in your influential paper.

Please assure your readers that the invitation to Cincinnati is prompted only by the highest motives of hospitality, patriotism and a desire to foster the industrial enterprise of our country. The gentlemen who will come together upon the 22d of January next will come uncommitted to any policy other than the promotion of the general welfare. It is hoped that by their combined thoughtfulness and wisdom a framework may be constructed upon which shall rest an organization whose force for good will be felt throughout every section of our country.

Where the future headquarters of the association shall be located, or who will be its officers, are matters of detail, which no effort has been made to forecast or forestall. If the strong and earnest workers who have made our country the greatest manufacturing country on earth will come together, our citizens will bid them welcome, and our committee expects to point with pride to the structure which they will erect.

Relying on the continuance of your kindly offices, we are, very respectfully,

W. T. PERKINS, F. PENTLARGE, CHARLES F. THOMPSON, H. C. YEISER, B. W. CAMPBELL,
Committee from the Manufacturers' Ass'n of Cincinnati and Hamilton County, Ohio.

The headquarters of the Brotherhood of Locomotive Firemen have been moved from Terre Haute, Ind., to Peoria, Ill.

The Chicago & Eastern Illinois shops at Brazil, Ind., are being removed to Momence, Ill., and some of the machinery has already been removed to the new site. Small shops will continue to be maintained at Brazil.

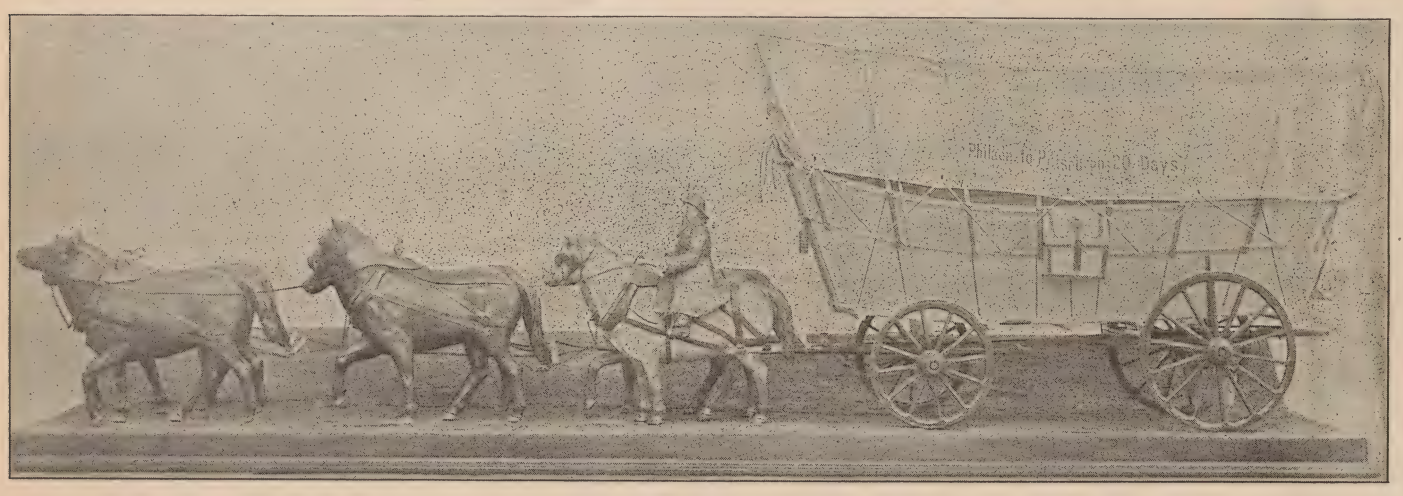
A double-headed passenger train on the Oregon Railway & Navigation line was ditched near Bowles Junction, Dec. 22. The rails spread and threw both engines and the mail and baggage cars into the ditch, killing one engineer and seriously injuring the other engineer and both firemen. The coupling between the baggage and first passenger cars broke and left the balance of the train on the track.

The Pennsylvania Railroad's Columbian Exhibit.

"The Pennsylvania Railroad Company at the World's Columbian Exposition, Chicago, 1893," is the title of a handsomely bound and beautifully illustrated and printed book of 300 pages, the contents of which conform to the sense of the title and describe and illustrates the many different features of the company's famous exhibit at Chicago, which was sent to the Field-Columbian Museum immediately after the close of the Exposition, and is now installed in halls 41 and 57 in the East Pavilion of the Museum Building at Jackson Park, Chicago.

We are indebted to the courtesy of Mr. Theodore N. Ely, Chief of Motive Power of the Pennsylvania Railroad, for the use of the cuts presented herewith, which reproduce from the book mentioned illustrations of some of the old cars and locomotives that played an important part in the early history of American railroading.

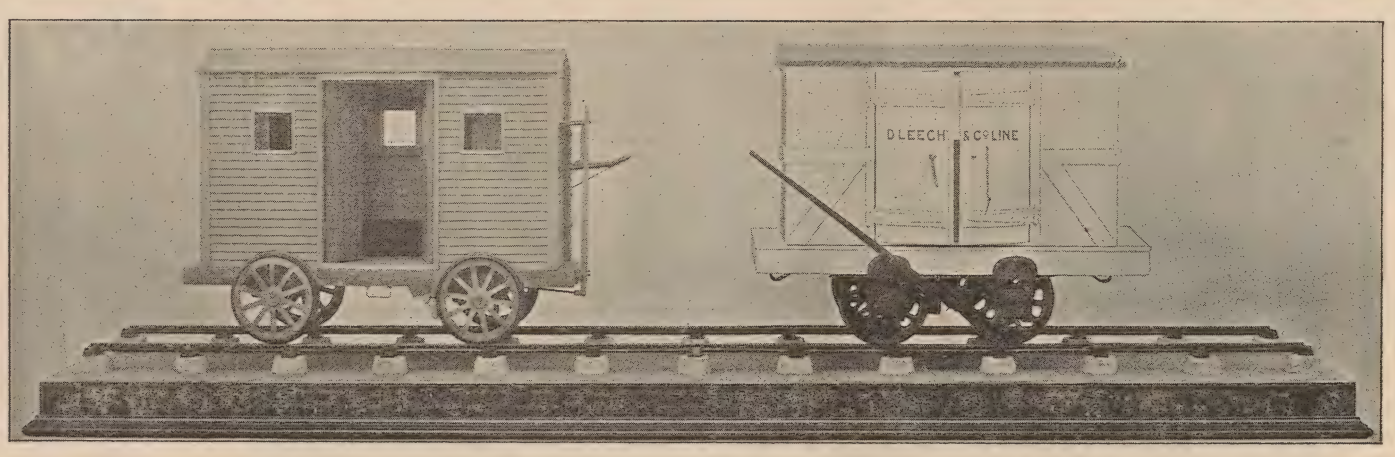
Our first illustration takes us back to the time "before the railway era," and shows a "Conestoga" wagon then used to transport people and merchandise from the East across the Alleghanies to the Ohio and Mississippi Valleys previous to the introduction of the railways. It used 20 days to go from Philadelphia to Pittsburgh. Doubtless the distance covered by the wagon then was greater than that by rail now, but the 354 miles between these cities is now covered by the Pennsylvania Railroad express trains in less than 12 hours, and by the fastest trains in 8 hours and 50 minutes.



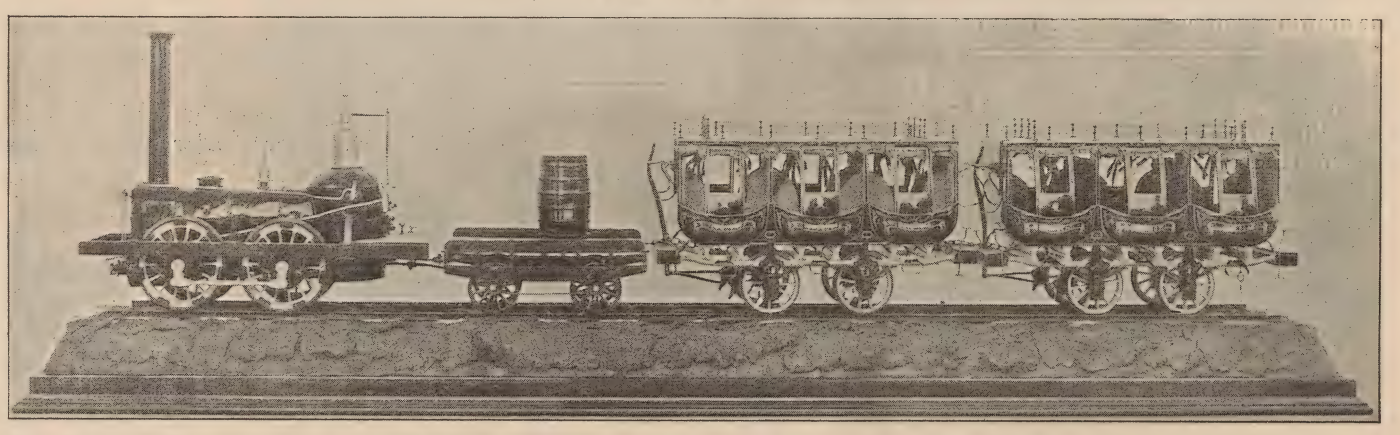
A "Conestoga" Wagon.

Between the "Conestoga" wagon and the old cars illustrated herewith there were but a few years of actual time, but an age of improvement, measured by the actual efficiency of the two modes of travel. These cars were used on the Old Portage Railroad in 1834. The passenger car had a shingle gable roof, and was sheathed with "weather boards." It had two longitudinal seats with backs against the sides of the car. Another illustration shows a considerably improved car which was put in service a year later, in 1835. It had the same arrangement of seats, but the roof was flat, the entrances were at the ends, where platforms with railings extended improved facilities for entrance and exit.

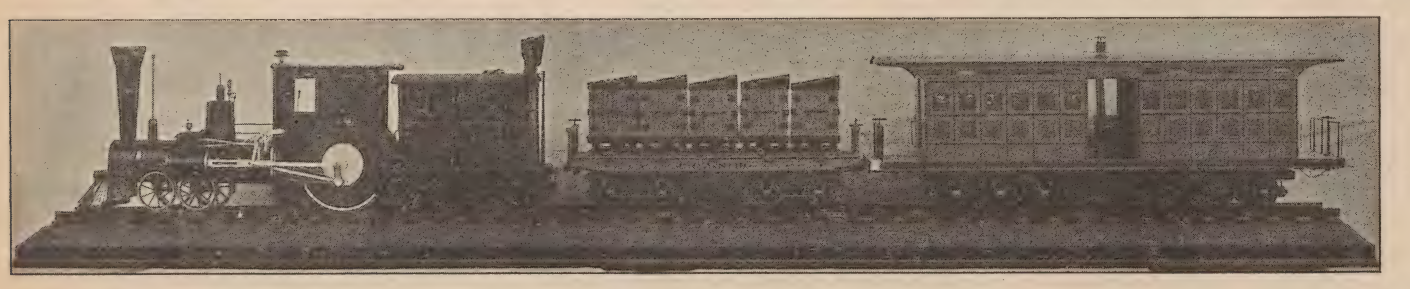
Another illustration shows the first steam locomotive of which there is reliable record that carried people on a track in America. It was built by John Stevens at Hoboken, N. J., in 1825, and began railroad service, its record through 1826 and 1827 being traceable. When the question of building a railroad from Philadelphia to Columbia was under consideration, a model of this engine was submitted to a committee of the Pennsylvania Society for Internal Improvement, and settled the question of the feasibility of the enterprise



Passenger Car, 1834. Old Portage Railroad. Freight Car, 1836.

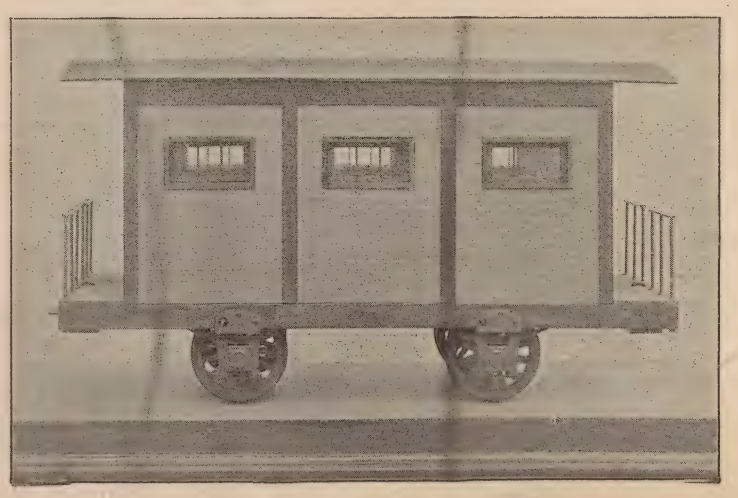


The "John Bull" and Train, First Steam Train in New Jersey, 1831.

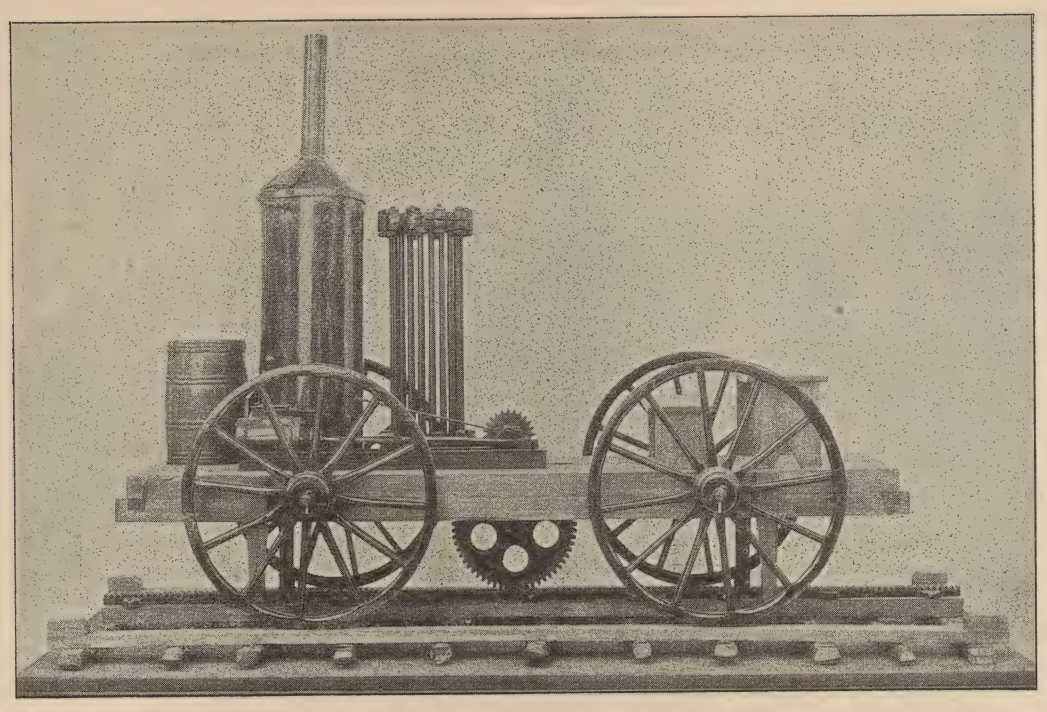


The "John Stevens" and Train, 1850, Camden & Amboy Railroad.

The peculiar looking passenger train shown in our next illustration was of later development—1849 and 1850. The locomotive was named after the great pioneer promoter of American railroads who built the locomotive mentioned in the foregoing paragraph 25 years before. This engine had 7-foot driving wheels. Several engines of this type were afterward built with 8-foot drivers, and were called "monsters" by the employees. The baggage car was simply a flat car, and carried a number of crates on wheels. The baggage was placed in these crates and conveyed across ferries without removing it from them. The passenger car



Improved Old Portage Passenger Car, 1835-1835.



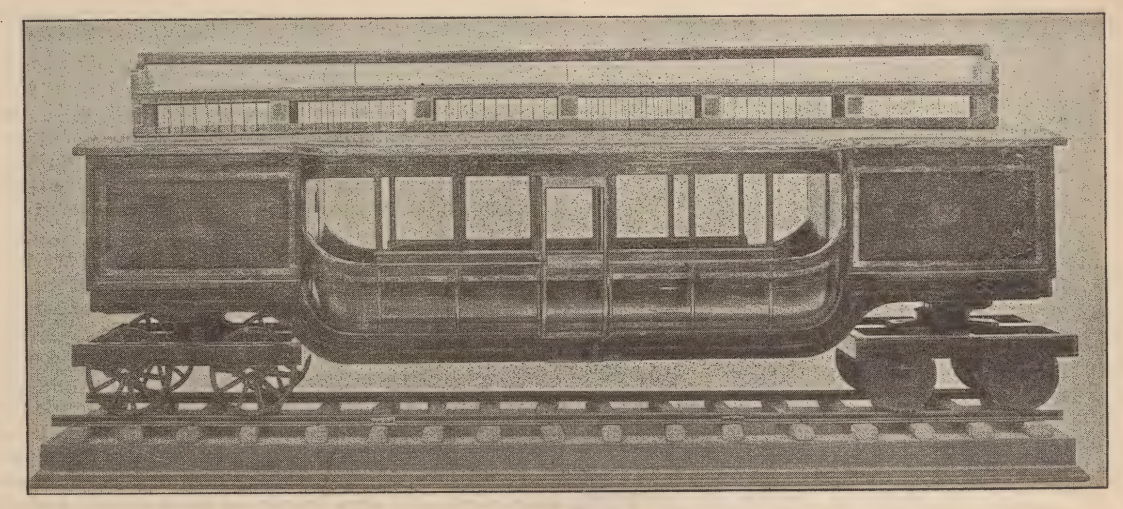
The John Stevens Locomotive, 1825, First American Passenger Engine.

had doors in the middle of the sides, in addition to those at the ends, much like our baggage cars of to-day. A prominent feature of the car is the stove seen through the open doorway. We are told that it was a wood-burning stove, and we are led to wonder if its introduction was not considered a great comfort and luxury at that time.

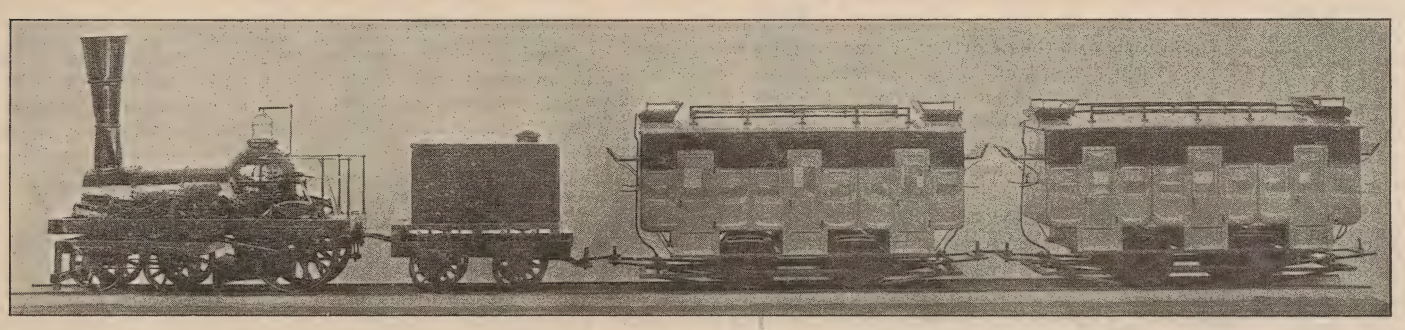
A further improvement in passenger car construction is shown in our next illustration, which is of the *Victory*. This was one of the first passenger cars built with 4-wheel trucks, and it ran for some time between the business part of the city of Philadelphia and the landing of the ferry boat that crossed the Schuylkill River. This was in 1834, and before the railroad bridge was constructed near Belmont Plane.

Our next illustration shows the first steam train in the State of New Jersey, Nov. 12, 1831. The passenger cars were very gaudy affairs of the stage-body pattern. It was drawn by the *John Bull*, which had just been sent over from England, and inaugurated the train service of the Camden & Amboy Railroad.

The locomotive *Lancaster* and its train of stage-body



The "Victory," One of the First Passenger Cars with Trucks, 1834.

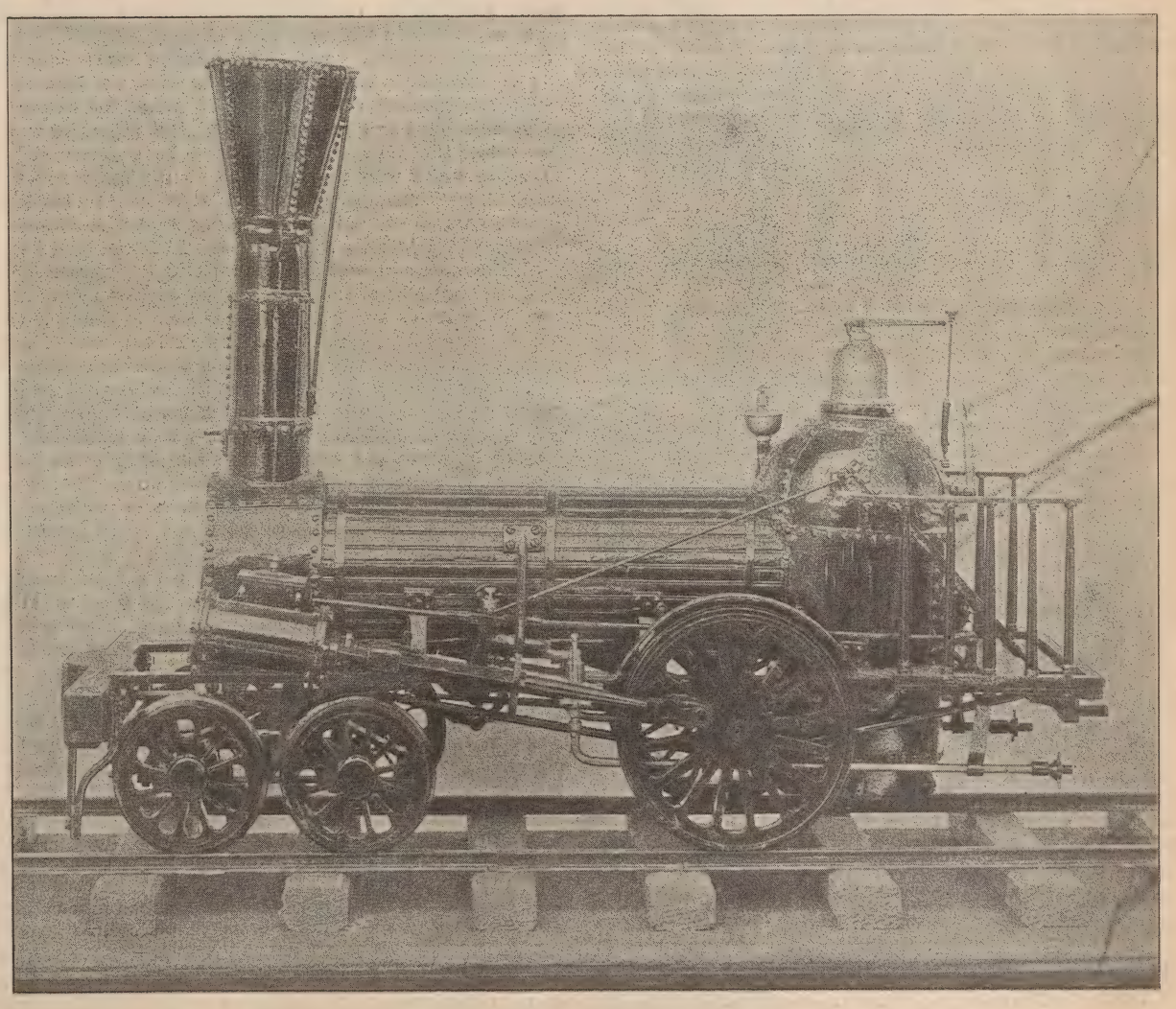


The "Lancaster" and Train. Early Baldwin Engine and First Steam Train on Pennsylvania Railroad, 1834.

cars show that four years of experience in operating railroads suggested numerous improvements. The cars are less highly elevated, the tender holds more water, the foot plate of the locomotive is surrounded by a railing for the protection of the enginemen; and it is evident that the problem of smokestack construction had begun to receive attention, so we see at the front of the engine somebody's idea of perfection embodied in sheet iron. We are told that the cars of this train were originally built to be drawn by horses, but were afterward modified for steam traffic. They and the *Lancaster* comprise the first steam train that ran on the Pennsylvania State Railroad. This was in 1834. The *Lancaster* was built by Matthias Baldwin at Philadelphia, for the Philadelphia & Columbia Railroad. It was one of three similar locomotives built by the founder of the Baldwin Lacomotive Works in 1834.

The American locomotive begins to appear in the namesake of the "Father of his Country," the *George Washington*. This engine proved worthy of its name. For if the illustrious George successfully performed an unprecedented up-hill task in freeing this country from British rule, so also did this iron namesake successfully perform an unprecedented up-hill task, for it was the first locomotive to climb a heavy grade. It was built in Philadelphia in 1835 by Messrs. William Norris & Sons, to demonstrate the fact that the Belmont Inclined Plane, in the suburbs of Philapelphia, could be dispensed with.

The Buffalo express on the Lehigh Valley Railroad met with a serious accident three miles from Wilkesbarre, Pa., Dec. 18. The train ran into an open switch at Harton's and plowed into a number of coal cars standing on the track. The engine, baggage and express cars were badly wrecked. The engineer and fireman jumped to save themselves from injury. The passengers, most of whom were asleep, were badly shaken up, but none was hurt. A large number of coal cars standing on the switch were wrecked. Traffic was delayed for several hours.



The George Washington," 1835, First Locomotive to Climb a Heavy Grade.

Progress of the Y. M. C. A.

At the annual dinner of the international committee of the Young Men's Christian Association held in New York recently, Mr. C. J. Hicks gave an interesting account of the work among railway men. He said that the New York Central and the Pennsylvania railway companies were the staunchest friends the association had in this work, and that the example of these roads was having a marked effect on other companies, which are slowly but surely coming to encourage the association's railway work. Railways, in their corporate capacity, were at the present time contributing $130,000 annually toward carrying on the work among their employés. One consequence was that a decided decrease in the number of accidents was noted on these roads, due, it was believed, to increased temperance among the men, which was fostered by the association. The Young Men's Christian Association movement has had a remarkable growth in the last 30 years. There are 1,397 associations in North America, with a total membership of 232,653, and owning 291 buildings worth $15,155,950. There are over 500 college associations, with a membership of 30,000.

It is reported that the Baltimore & Ohio Railroad is to erect repair shops at the junction of the Pittsburgh & Western and Lake division, a short distance east of Warren, O.

The Chicago & Alton has put on a new fast train service between Chicago and San Francisco by way of St. Louis and the Iron Mountain and Texas & Pacific route, which it styles "the true Southern Route Limited." The train leaves Chicago every evening at 5 o'clock, and will carry first-class sleepers from Chicago to Los Angeles and San Francisco, and free chair cars from Chicago to St. Louis. The running time between Chicago and San Francisco is shortened six hours.

The Scrap Pile.*

BY J. N. BARR.

Pass through a railroad storehouse and note the stock of material. Here are castings of all patterns, fresh and clean from the foundry; bolts and nuts neatly piled awaiting shipment; lanterns of various patterns, cans, buckets, rubber goods and all the various items necessary to keep that vast machine, the railroad, in operation. With what system everything is arranged! The man in charge can without a moment's delay, and almost in the dark, lay his hands on any article. Let us now turn to the scrap pile. We find precisely the same articles as in the storehouse. They are not prim and new and neat; they are battered, rusty, broken and worn out. They are not in orderly array, but are scattered in miscellaneous confusion, except possibly you will find wrought iron, cast iron, brass, rubber, tinware. etc., in separate piles. To a superficial observer the array in the storeroom is much the more interesting, and yet it is hard to say why. Those storeroom articles have only one little sentence to repeat, and that is "I am to be used for such and such a purpose." Turn now to the articles in the scrap pile. They have been making history. If carefully questioned they are eloquent with the eloquence of plain, simple truth. On those battered and broken and worn out pieces is written the history of the great machine called the railroad. Not only can we read the history of the machine itself, but many a tale of carelessness, of ignorance and even viciousness is here recorded against the operatives. Many a tale of a disappointed inventor and poor designer can here be read.

Look at that broken bolt. It says, "I was too small and weak for the purpose to which you put me. Now you can see from my unfortunate condition that you were entirely wrong in imposing such duties upon me. Go to the storeroom, take my brethren, and give them other and lighter duties, and assign my duties to a stouter and more robust individual."

Look at that wheel with the long flat spot on it caused by sliding. How plainly it says, "I was in good condition, ready and willing to assist in carrying that car for several years. That brakeman was too indolent to go to another car and apply the brakes to assist in stopping the train. I gripped the rail with all my force, but that brakeman kept pressing the brakeshoe harder and harder against me until I lost my grip and slid. Now, here I am, just in my prime, in the scrap pile, because that man, paid to look after the interests of the company, was too lazy to do so."

Look at that pile of brasses. What a tale they tell of bad fitting, carelessness in oiling and jacking, overloading of cars, trucks running to one side, etc.

In addition to testimony of the above character, the scrap pile affords valuable testimony as to the efficiency of the men who make the scrap. From one man is received nuts and bolts which, although they have seen service, are still perfectly good for further use. The man found it easier to use new material than to exercise his head and eyes enough to select what is serviceable in the old material. One shop will send to the scrap pile pieces of staybolt iron just a little too short to be utilized for a staybolt, while from another the waste staybolt end will have but a few threads on. In hundreds of ways the scrap pile tells the story of thrift and intelligence, or the reverse, on the part of the men who have charge of the mechanical work along the line of the railroad. Another point which lends a great interest to the scrap pile and one of great practical value, is that much of the material found in it can, for a small sum, be utilized for purposes akin to its original use, and be fully as serviceable as new material. Of course there are large quantities of material which can only be ut ilized through the medium of the foundry, the forge and the rolling mill. But it is the opinion of the writer that much material finds its way to these great converters that could for a much less sum be made perfectly serviceable with the appliances at hand in most railway shops. The definite question to be discussed in this paper is: "How shall the scrap pile be handled to make its information most available, and to utilize such material as may be made serviceable with a small expenditure of money?" In the *first* place, all material unfit for further use should be shipped to one central point, which should be located at the main shops. *Second.*—While it is not necessary to assort this material as carefully as the new material in the storehouse is assorted, there should be a better assortment than the one usually prevalent of wrought scrap No. 1 and 2, busheling scrap, etc. *Third.*—Special attention should be given while unloading to sorting out good material and what is readily convertible into good material. *Fourth.* Methods of handling the second-hand material should be carefully worked out and the cost carefully scrutinized, or rejuvenating material will become a matter of sentiment rather than one of profit.

For the proper assorting of material a series of suitable bins should be provided, varying in capacity to meet requirements. The writer will give a few examples to illustrate the use of bins. In handling bolts, for example, a bin is required in which all bolts are deposited as unloaded. The crooked bolts are taken to the blacksmith shop to be straightened, and they and all straight bolts are then taken to the storage bins. These bins are divided into compartments, so that all old bolts of the same diameter, and which will make good bolts of equal lengths, are placed in one bin. These compartments are all labeled. For example, there is a row of compartments carrying bolts one inch in diameter. The first one is labeled 1 × 15 inches, which is the length of the longest bolt in general use. The next is labeled 1 × 14 inches, and so on down to the shortest bolt in use. All bolts, which by trimming and recutting can be converted into a good bolt 10 inches long and no longer, are placed in the compartment labeled 1 × 10 inches. The bolt itself may be longer than 10 inches, but the necessary trimming will bring it to that length.

The bolt bins are located conveniently to the shop in which the machinery for cutting round iron and threading bolts is located. When the shop receives an order for, say, 100 bolts 1 × 10 inches in length, a hundred bolts are taken from the compartment labeled 1 × 10 inches. These bolts are taken to the shears, and if any longer than 10 inches the surplus metal is sheared off. They are pointed and threaded and are then in shape to be shipped. It should be observed that in handling bolts in this way the expense of heating and heading is avoided, and this expense nearly, if not quite, offsets the cost of handling and straightening the old bolts, so that the difference between the cost of bolts obtained in this way and bolts made from new material is just about the difference between the cost of new round iron and scrap.

Since this process was inaugurated but a small quantity of round iron has been purchased; the amount of purchases by the C. M. & St. P. Company since Jan. 1, 1894, to Nov. 15, 1894, is 154 tons. The purchases are confined almost entirely to iron ¾ and ⅞ inches in diameter, the supply of old bolts of these diameters being insufficient to meet requirements. In looking over the scrap pile a large quantity of round iron varying in diameter from 1⅛ to 1½ inches is found, which, if rolled down to 1 inch and ⅞ inch diameters would more than meet the deficiency referred to above. It is proposed to erect a set of small rolls for the purpose of bringing these odd sizes of iron to the requisite diameter. With this arrangement it is the opinion of the writer that the necessity for the purchase of any new iron for the purpose of making bolts will be entirely obviated,

It will be found in sorting over bolts and cutting them to the desired lengths that there is a large accumulation of stub ends which are too short to be of value in making bolts. All the stub ends ¾-inch in diameter and 5½ inches long, answer perfectly for the manufacture of track bolts. One of the bolt-heading machines has been equipped with dies suitable for forming the head of track bolts, and in this way a large quantity of track bolts have been made out of what was otherwise strictly waste mateaial. With the rolls above referred to, it is believed that a sufficient supply of ¾-inch iron will be obtainrd to furnish all track bolts required. The above covers our process of handling scrap bolt material.

Considerable progress has been made in handling and utilising second-hand nuts, which on account of injury to the thread, or worn thread, are unfit for further service. The nuts are collected and assorted very much the same as bolts. One of the bolt-heading machines has been fitted up with dies suitable for compressing the nuts slightly. A compression sideways of about 1-32 inch is sufficient to close the nuts so that, in retapping, a nut with a practically full and perfect thread is obtained. It has been found desirable to pickle the nuts in a weak solution of hydrochloric acid, in order to remove rust and thus prevent undue wear of the taps. With our present arrangements the results obtained from handling the second-hand nuts is not as satisfactory as is the case with bolts. There is no question, however, but that a large supply of nuts can be obtained in this way at a materially lower price than what we would have to pay for new material.

In following up the assorting of nuts one bin was selected for the reception of track nuts. As these began to accumulate it was noted with some surprise on the part of the writer that nearly all the nuts had stub ends of bolts in them. The first impression produced was that the wrenches used by the trackmen were long handled, or the trackmen were unusually robust. A closer inspection, however, revealed the fact that each nut showed decided indentations on the outside. They told the story completely. The trackmen were ingenious and found that the most expeditious method of removing the bolts was to administer a sharp blow with the spike maul. This is undoubtedly a time saving and labor saving method. As to its being a money saving method the facts are not so clear. A man receiving $1.50 per day can by this method remove at least 10 kegs of track bolts, worth about $25, and he converts this $25 worth of material into scrap worth to the company $3 or $4.

It is quite interesting to note how wrong impressions arise and are fostered in the solitude of the office are dispelled by the silent testimony of the scrap pile. When the writer first proposed closing and retapping nuts, the objection was at once raised that much difficulty would be experienced with wrenches which were now adapted to the standard size of nuts. After some discussion and reference to the list of standard size of nuts, it was decided that it would not be necessary to reduce the nut more than 1.32 of an inch for successful tapping and that this would not interfere seriously with the operation of the standard size as laid down in our tables as much as one-eighth of an inch in width of head, and that it was necessary to assort nuts for the same diameter of bolts into at least four piles in order to use the dies successfully in compressing them, also that the weight of a hundred nuts from the scrap pile was nearly 25 per cent. greater than that of a hundred standard nuts. It is with some hesitation that the writer thus announces his superior ignorance of the practice on the road with reference to nuts. He can say however, that the list of sizes in the office is perfectly correct to the nearest sixty-fourth of an inch, and it is certainly very convenient in making drawings.

In addition to the items which can with a little attention be converted into useful material for the same service as that for which they were originally designed, there are large amounts of material, which, with a little shearing and straightening, can be used for purposes which differ from their original use. For example, crown bar washers can always be supplied from clippings which would otherwise be waste material. Centre pin plates in sufficient number to equip all new cars can be obtained from the scrap sheet iron pile for the cost of shearing and straightening; and this brings up the question of the treatment of sheet iron in the scrap pile. The most effective results so far have been obtained by sorting the sheet iron coming to the scrap pile with reference to its thickness and, to a certain extent, with reference to its condition. A washer punch in connection with the scrap sheet iron pile would undoubtedly furnish all the washers required by a railroad company, for the expense of punching. This is especially true if a small set of rolls were at hand to bring the plates of varying thickness to just what may be required. Indeed, a small set of rolls seems to be one of the most useful adjuncts to a railroad blacksmith shop, and could be utilized in many ways besides those already mentioned.

Examples might be multiplied indefinitely like those above without adding anything of special value to this paper. The scrap pile in reality should include not only parts of machinery, but also complete machines, cars and locomotives which are no longer fit for service. It seems to be the impression, in the case of cars and locomotives, that general rules for scrapping them can be elaborated in the office. The writer is of the opinion that such rules fall far short of accomplishing their purpose, and that only a careful and judicious inspection, as in the case of any other material going to the scrap pile, can insure the best economy. In order that the scrap pile may tell as complete a story as possible all items of importance should be dated both when placed in service and when removed, and, with many articles, the name of the maker should also be designated. In this way many articles which are of scarcely sufficient importance to warrant a systematic record could be made to furnish valuable informa1 tion.

In conclusion, in order that the scrap pile may furnish as much information as possible, and that the material therein may be fully utilized, it would seem that the following general principles should prevail: *First.*—The scrap pile should be in charge of persons of as much intelligence as is required for any position on the railroad. *Second.*—All material should be carefully assorted and placed in appropriate bins when deposited in thescrap pile. *Third.*—All good material should be separated at the time of unloading from the scrap material. *Fourth.*—The method of handling the scrap materia which is to be put to further use should be as systematic and carefully elaborated as that of handling new material. *Fifth*—The machinery for handling and rejuvenating scrap shouly require as much attention as that of the machinery for and other line of work.

* Read to the November meeting of the Western Railway Club.

Smoke Prevention.

The following is an abstract of a paper on the above-named subject that was read before the Academy of Science at Chicago recently by Mr. C. M. Higginson, of the Chicago, Burlington & Quincy Railroad. Mr. Higginson has made the subject of the combustion of coal a special study, and while his remarks in the paper published herewith are principally in relation to smoke prevention, they are also of interest to all responsible for the economical use of fuel, as the principles of combustion are clearly and correctly outlined, and it is upon the observance of these in practice that economy of fuel largely depends in locomotive as well as in all other branches of steam engineering:

The fuel that is in the most general use with us is bituminous soft coal, containing a large amount of volatile matter which, when driven off, is colored to a greater or less degree, the visible portion forming what we know as smoke. In dealing with the matter of smoke prevention, we have got to take up that of perfect combustion of the fuel. One trouble that has existed in the past, as regards both economy of fuel and smoke prevention, is that they have too often been considered from a mechanical rather than a chemical stand-point, and the necessary conditions for efficient service overlooked. Added to this is the fact that the fuel bill, though one of the largest items of expense, is not as closely looked after as are many other matters much smaller in amount. There is too often the feeling that it is rather a necessary evil, and the working of the steam plant is left in the hands of some so-called practical man whose vision or aims toward economical service are quite limited.

Perfect combustion causes not only the prevention of smoke, but the economical use of the fuel as well, the visible smoke being merely an index of the waste of fuel, though the actual coloring matter in sight may be but a small percentage of the whole. Prevention or stoppage of the combustion of the volatile gases driven from the coal, allows a portion of the carbon to be precipitated in a visible form which we know as smoke.

One ton of average bituminuous coal will contain, of heating matter, say 1,040 pounds of fixed carbon and 660 pounds of various carbureted hydrogen gases. Each pound of carbon will evaporate, in round numbers, 15 pounds of water at a temperature of 212 degrees. Each pound of the volatile gases will evaporate on an average 22 pounds of water. The combustible products of a ton of coal if perfectly utilized, will evaporate water from 212 degrees as follows:

Fixed carbon	15,600 lbs.
Volatile gases	14,520 lbs.
Total	30,120 lbs.

or 15 pounds of water to the pound of coal.

It will be seen that the heating power of the gases is nearly equal to that of the fixed carbon, yet the value of a coal commercially is often rated according to the fixed carbon, while we have cases of coals containing a small amount of ash and waste, a small relative amount of fixed carbon, and a large amount of volatile matter which, if properly used, would evaporate more water than many others having higher fixed carbon.

Combustion is the union of the oxygen in the air with the carbon and hydrocarbons in the coal or other fuels. In order to supply this oxygen, a large amount of air is neccessary, amounting in practice to about 18 pounds of air, or 225 cubic feet, to each pound of coal burned. This shows how important a part the air around us plays in perfect combustion, and how necessary a free and full supply is. It has been found by experiment with soft coal that the following conditions are necessary for its perfect combustion and freedom from smoke:

1. A good draught.
2. Open grate bars.
3. Means of supply of air above the fire.

4. Means for promoting a perfect admixture of the air and gases.

5. Distance in which to complete the combustion of gases.

We will now touch upon each of the above requisites.

First.—A certain amount of violence is necessary in bringing the atoms of oxygen and the combustible elements of the coal together to insure good combustion. This is accomplished most simply by a quick draught, which, as a rule, should not be less than that shown by a vacuum of three-tenths inch of water.

Second.—Unless there are openings between the grate bars amounting to about 50 per cent. of the whole grate surface enough air cannot get to the fixed carbon of the burning coal.

Third.—While in the case of anthracite coals nearly the whole amount of air needed for combustion can be let through the grates, careful experiments have shown that the bulk of air which is nccessary to burn the gases driven from soft coal must be let into the firebox above the line of the fire. It is claimed by some that this can be best done by running with such a light fire that a surplus of air can pass between the burning coals sufficient to unite with the gases above. While this might be done with theoretically perfect firing, we find in practice that in the effort to have the fire thin enough to admit of the passage of sufficient air through it, holes are left which allow such quantities to pass through that the steaming qualities of the boiler are interfered with. When the firing is too heavy, aside from the loss by gases being driven from the top of the coal unconsumed, there is an additional loss from the fact that the carbonic acid formed in the lower part of the bed of coals takes up, in rising through them, an additional amount of carbon, forming carbonic oxide, the additional carbon so taken up being wasted. The supply of air let in above the fire aids in burning this gas also. Carbonic oxide gas burns with a blue flame, forming carbonic acid. It is this gas burning which gives the light blue flame so often seen in hard coal stoves.

Even in the case of burning anthracite coal, experiment shows that a moderate amount of air supply over the fire is an advantage to burn the carbonic oxide, which would otherwise be wasted.

Fourth.—The combustion of the gases, which are driven off rapidly, can only be made perfect by an intimate admixture with air, and under conditions which insure a temperature of not less than 900 degrees at the point of such mixture.

Fifth.—Most of the Western bituminous long flaming coals require a flameway of fully 20 feet in which to complete combustion before the tubes are reached. Experiment shows that the burning gases are chilled so rapidly on entering the tubes that combustion is checked and smoke made; hence the necessity of a long flameway.

It must be remembered that a well arranged plant will give good results with ordinary care in firing, yet absolute carelessness will cause smoke to be made with any device that has been or can be placed on the market. In firing up a cold boiler, smoke will be made for a short time with any device extant, unless care is taken to use sufficient kindling or a little coke until the parts get thoroughly heated.

Welding.

The following is an abstract of a paper describing the different methods of welding, read at the recent convention of the National Railroad Master Blacksmiths' Association by Mr. S. Uren, General Foreman of the blacksmith shop and rolling mill of the Southern Pacific Railroad at Sacramento. Mr. Uren is a well known expert in blacksmithing, and is the inventor of several valuable machines used at the Sacramento shops:

The different methods of preparing iron to be welded are governed by the conditions and shape of the forging and appliances. Lap welding is the usual method adopted by smiths, and when practicable, in my opinion, is the best. In many cases there is not enough care taken in preparing the parts to be welded. The scarfs should be as long as can be conveniently heated, never more than a 45-degree angle. The scarfed surfaces should be slightly convex or high in the center, so that when the two pieces are laid together for welding the center will take its bearing first, as it is absolutely necessary that the center of the bar should be welded first. Prior to making the scarfs, upset the bar back as far as it will be exposed to intense heat, for the purpose of lamination over the whole length of the heated surface, as it is imperative that the iron that has been near a welding heat should be as perfectly hammered as the welded part. After the preparation of scarfing is complete, lay the two pieces carefully in a hollow fire and bring to the proper heat. Before laying together be sure no foreign element has adhered to the scarfed surface. In laying together the point of one scarf should just reach the heel of the other. The weight of the hammer used to weld the two pieces must be governed by the size of the bar, as the blow should be sufficient to affect the center of the metal. With this precaution a good weld will be secured.

I again call your attention to the proper treatment of the iron back of the weld, as I consider this of vital importance. In many cases in testing welds by breaking transversely, I find good fibrous iron in the welded section and crystalline each side of the weld. The cause of this is improper treatment of the iron back of the weld or that it was not properly upset where it was brought too near a welding heat. The molecular structure of wrought iron becomes disintegrated to a certain extent when brought to a high heat; consequently if there is not sufficient metal back of the welded section to receive the necessary lamination to bring the disarranged molecules to their original position, the strength of the bar is greatly impaired.

I have made a series of tests on this subject in the manufacture of car axles. The usual method of making axles is to first rough the pile, then finish each half at separate heats.

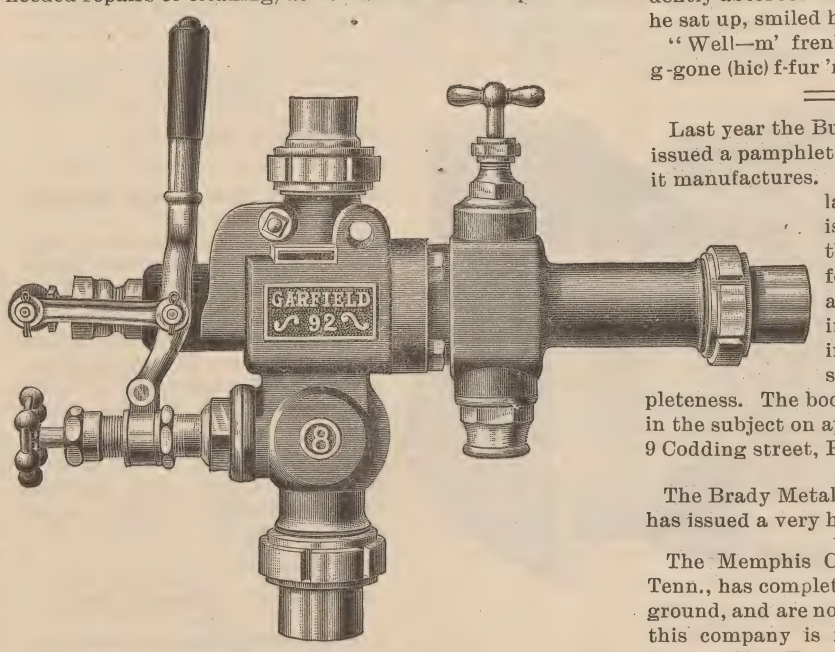
"V" welding consists of a combination of butt and lap welding. The scarfs are formed by fitting the two pieces together at an angle of about 45 degrees. In preparing the scarfs make the throat of the inside angle a little rounding and the point of the outside angle to correspond. The scarfed surfaces should be a little convex across the surfaces, as in the lap weld, for the purpose of insuring a perfect weld in the center of the bar. This method of welding is usually adopted where large pieces of iron are required to be welded. In all cases in this class of welding the throat should be welded first, by being driven together with a battering ram or heavy sledge hammer, applied at the end of the bar when brought to the proper heat, before being taken out of the fire if practicable. The piece is then placed on the anvil and the two laps welded. The same care must be taken back of the weld as explained in lap welding. A good weld can be produced by this method if a good clean heat is secured and the above treatment carried out.

Butt welding is simply and easily prepared for the work by upsetting the ends, leaving the surfaces a little convex. This method of welding requires great care in bringing the two pieces to be welded to precisely the same heat and keeping the surfaces perfectly clean. When brought to the proper heat the parts should be thoroughly forced together with heavy sledges or a battering ram. For general purposes I do not approve of this method; for small welding it is impracticable; in all cases, in my opinion, the V or lap weld is preferable. In every case the broken section of this class of welds shows a crystalline structure.

The method of welding by laying in V or angle pieces is adopted for heavy rings or framework of any description. In framework the different parts to be welded should be firmly bolted together so as to retain the members in their proper position while the welding in of the angle piece is performed. This welding requires good judgment on the part of the smith. The two ends to be welded should form an angle of about 55 degrees when bolted together; the angle piece to be welded in the cavity should be about 5 degrees less angle than the opening of the two ends of the bar, for the purpose of insuring a perfect weld in the bottom of the recess, and must contain cubic inches sufficient to properly fill the opening. Care should be taken that the fibers of the piece to be welded in are in the same direction as the bars to be welded. In the Southern Pacific shops we make special iron for this purpose from old horseshoes. The preliminary preparations being made, the parts to be welded are placed in the fire, the small angle piece usually in a separate fire. When brought to the proper heat the bar is placed on the anvil and the small angle piece forced into the cavity with heavy sledges, thoroughly welding the angle surfaces of the two ends of the bars; the same operation is performed on the opposite side of the bar, making a complete weld. In 1880 I adopted this method of welding on the legs of locomotive frames instead of the old method of jumping them on the main bar.

The Garfield Injector.

The accompanying illustration shows the "Garfield" injector, which is made by the Detroit Lubricator Company, of Detroit, Mich. This injector has a number of advantages as a locomotive boiler feeder. In the first place it is sold at a low price, and the makers guarantee its satisfactory operation. They will place injectors on trial whenever requested. The interior arrangement of parts is such that the water passes through in a direct stream. This is of particular advantage where there is much grit in the water, as it prevents the rapid wearing of the parts. It is easy of access for needed repairs or cleaning, as it can be taken apart with ordinary wrenches, and the tubes can be removed without difficulty. This is particularly advantageous in districts where there is trouble from "liming up."



THE GARFIELD INJECTOR.

The operation of the "Garfield" injector is very simple, it being started by a single movement of the upright handle, and it can be adjusted to very fine feed, and yet has very high delivery capacity when working at its maximum rate. In other words, it has a wide range of capacity, which, as is well known, is conducive to fuel economy in locomotive service. Its construction is such that disinterested expert mechanical opinion has pronounced it to be more economical to maintain than even the non-lifting injectors, because of easy access, simplicity of parts, and the small cost at which they can be renewed when necessary. The injector starts with a minimum waste of water at the overflow, as it is fitted with a loose check-plate in the interior which makes it quick acting. It is a restarting injector, and restarts itself if the feed is broken. It goes quickly to work after being used as a heater, and is practically noiseless in its operation. The makers are receiving a good many gratifying testimonials as to the efficiency of the "Garfield" from the railroads that are using it.

Steel Tired Wheels.

The National Car Wheel Company, of Buffalo, N. Y., has issued a neat cloth-bound catalogue of the steel tired wheels it manufactures at its shops in Buffalo and Chicago. These wheels are illustrated and described in detail. This company makes wheels composed of the fewest possible parts, and is making wheels of the simplest construction compatible with a proper union of tires and centers, which must necessarily be composed of different metals.

At Buffalo, N. Y., the company has shops which have been extended during the past year, and are fully equipped with the most improved machinery and tools used in its business. The location is a very central one, with excellent facilities for making shipments in every direction promptly, and at reasonable rates.

At Chicago the company has a shop at No. 105-9 South Jefferson street, which is near most of the passenger stations. A this shop a specialty is made of turning steel-tired wheels, and fitting them to axles. The facilities and location enable this work to be done very promptly. Companies running cars into Chicago will find this shop a convenience, as it can turn or refit wheels and deliver them at the station within a few hours, if occasion requires.

A Human Aerolite.

A brakeman of the New York, New Haven & Hartford Railroad was idling about the pretty station of the road at Niantic, R. I., recently, waiting for his train to proceed. While there an express train came flying past with a rush and roar. It came, says a local exchange, and was gone in an instant in a whirlwind of dust and cinders. But even as it was bounding past the little depot, out of the confused, cometlike tail of steam and smoke and dust, the brakeman beheld a big, round, white ball suddenly quit one of the vestibuled platforms of the flying cars and betake itself into the air, like a splinter of a shattered meteorite.

It was a singular-looking projectile, revolving like a turbine water wheel, all a-flutter with light drapery, and seemingly stuck full of clawing legs and feelers, like a hitherto unheard-of and unclassified terrestrial devil-fish. It described a parabola, and the astonished brakeman had just time to dodge when it flew past him and went upon the ground. In an instant it was up again, went bounding along the earth a rod or more, struck again, tied itself in a knot, uncoiled, straightened itself on its back and then was still a while. Presently it sat up and gazed mistily at the brakeman. It was a commercial traveler.

It had the remains of a gripsack in one hand, the ripped-up wreck of a huge paper bundle in the other, and was weirdly draped with the tattered ribbons and strings of what was once, evidently, a very long and handsome white duster. The rimless crown of a black derby hat was jammed down over its ears. Sitting there on the hard turf, it gazed at the brakeman solemnly for a whole half-minute, and the brakeman gazed, too, at the dazed phenomenon, and neither spoke. Finally the phenomenon lazily rolled on its right side, studied the ground dreamily, and inquired in an indifferent tone:

"Wh—wh—whars—in—(hic)—that train goin', m' fren'?"

"Goin'?" echoed the puzzled brakeman; "why, its goin' to New York."

Thereupon the stranger studied the ground again, evidently absorbed in some mental computation; but presently he sat up, smiled hazily and added in a tone of conviction:

"Well—m' fren'—let her—go—then! Letter—go! I've—g-gone (hic) f-fur 'nuff!"

Last year the Builders Iron Foundry, of Providence, R. I., issued a pamphlet descriptive of the Venturi meter, which it manufactures. The pamphlet treated the subject very largely from a scientific standpoint, which is not the most convenient method for those who are not in the habit of using formulas or employing technical terms and algebraic symbols. The company accordingly now has in print a pamphlet describing the meter in a more every-day and less scientific manner, though with equal completeness. The book will be sent to those who are interested in the subject on application to the Builders Iron Foundry, 9 Codding street, Providence, R. I.

The Brady Metal Company, of 115 Broadway, New York, has issued a very handsome calendar for the year of 1895.

The Memphis Car & Foundry Company, of Memphis, Tenn., has completed its new works, which cover 50 acres of ground, and are now in active operation. Among other work, this company is rebuilding a large number of cars for the Kansas City, Fort Scott & Memphis Railroad. The plant is one of the largest in the United States, and no money has been spared in making it modern in every respect.

Steamship heating is a new field for the employment of electric heat which has attracted the attention of the Consolidated Car Heating Company, of Albany, N. Y. Its regular form of street-car heaters is in the main well adapted for steamship heating, but where desired the company is furnishing special forms of its heaters. The Consolidated company is already in communication with over a hundred steamship builders in this and other countries upon the subject of electric heating.

It is announced that the affairs of Queen & Co., of Philadelphia, the well-known manufacturers of scientific instruments, are to be speedily and satisfactorily adjusted. Meanwhile the company's large stock of drawing instruments and material, engineering, optical and photographic instruments and accessories, and philosophical and chemical apparatus, etc., etc., is being kept fully up to standard, and orders are being filled as usual. Considerable reductions have been temporarily made in the prices of these instruments.

The Consolidated Car-Heating Company, of Albany, N. Y., has issued Part XII., of its catalogue. This part is devoted to electric heaters, of which this company makes several styles suitable for warming street and steam railway cars. An extensive table accompanies the catalogue showing the cost of current for heating on a 500 volt circuit. A brief is also being sent out by the company in the matter of the adoption of electric heating for electric railway cars, in which the advantages of this method of heating are described in detail.

Sturtevant Stationary Blast Forges.

As the old-time bellows has been displaced by the more recent blower, so has the old-fashioned brick forge given way to the modern cast-iron forge as an article more durable and more efficient. The standard type of cast-iron forge for the regular smithshop handling medium and heavy work, as constructed by the B. F. Sturtevant Company, of Boston, Mass., is illustrated in Fig. 1. This forge is regularly made with dumping tuyere as shown in the cut. The water tank and coalbox are here combined in the same casting as the fire-pan, which measures 48 inches by 60 inches over all. It stands 26 inches high to top of rim, and will carry a fire 8 inches deep with side gates down and 6 inches deep with them turned back. This is the heaviest forge built by the

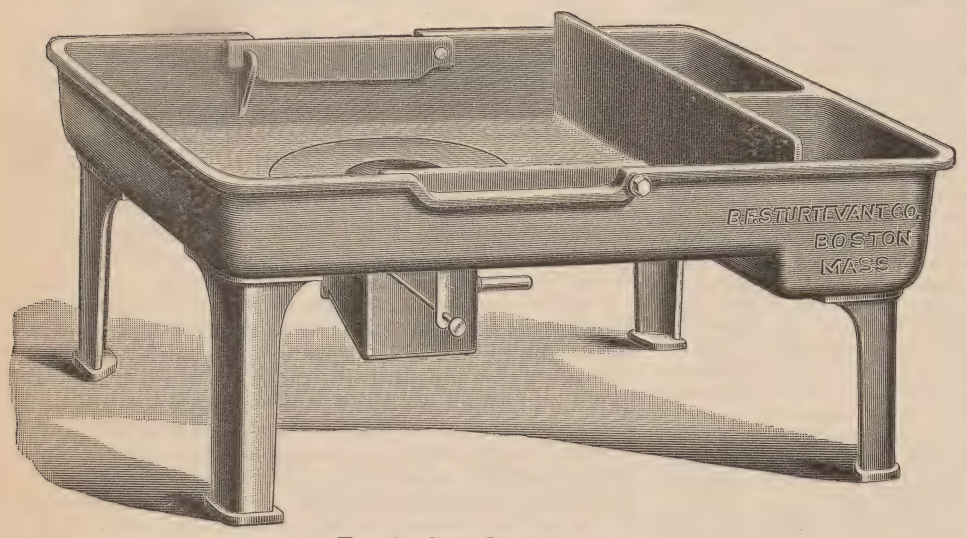


FIG. 1.—CAST IRON FORGE.

Sturtevant company, and is suited for extra heavy railroad work. Its weight complete is 750 pounds. The distribution of the air by the special adjustable tuyere furnished with this forge is such as to prevent burning out, and the design of fire pan in connection with the special fire plates prevents injury by excessive expansion.

This company also makes a steel plate forge, shown in Fig. 2. Although this is a new production it is meeting with a great deal of favor. Being constructed entirely of steel plate, it may be made of any dimensions without material difference in cost. The standard forge, however, is 45 inches in diameter and stands 25 inches high. The sides are heavy steel plate, re-enforced by angle irons at top and bottom, the latter serving as a supporting flange. The pan, of still heavier plate, is 4 inches beneath the top of the sides, and the firepan proper, of cast iron, is of such a depth as to permit a fire 7 inches deep, which will meet all requirements in

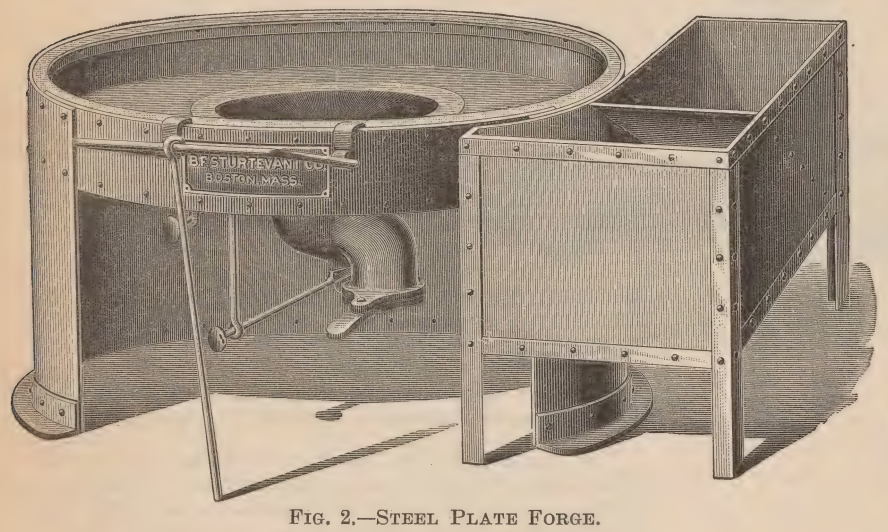


FIG. 2.—STEEL PLATE FORGE.

the ordinary blacksmith shop. The tuyere of this type is readily adjustable and easily dumped. The connection for blast can best be made from an underground system of piping. The blast gate extension where pipe connects to this forge is 3 inches in outside diameter. At one side, in the most convenient location, is placed a coal and water tank; the portion receiving the coal has a sloping bottom, making it easy to shovel out the coal. This combined tank is 16 inches deep, 45 inches long, 12 inches wide at the back, and 20 inches wide at the front.

Hoods of any desirable shape, adjustable or non-adjustable, are furnished with these forges when desired. Properly, their use includes a smoke exhausting outfit, consisting of an exhaust fan whose action, when properly connected with piping and hoods over the forges, insures the removal of all of the smoke and gases from the forge fires. It is unaffected by any change in the weather and makes the blacksmith shop comfortable and clear.

The system of piping and hoods can be adapted for any number of forges from 1 to 100. The makers have sent us an illustration of 100 of these in use in the smith shop of the Schenectady Locomotive Works. They make a specialty of drawing the plans for such outfits and also for contracting to do the work.

"Judge," said the young man with the torn clothes and the black eye, "considerin' the way the police done me up, I think you ought to let me down easy." "Young man, if you come here expecting this Court to be a parachute," replied the judge, with a harsh, police-court laugh, "you are away off your trolley. Ninety days."

Phosphor-Bronzes.

Phosphor-copper and phosper-bronzes are becoming more extensively used. The peculiar change which copper and bronzes undergoes when fluxed with phosphorus is not well understood, but the effects are fully appreciated, strength and toughness are increased and liability to corrosion decreased. For these reasons phosphor-bronzes are being used very largely in marine and railway construction. The charging of the phosphorus into the molten metal must be done with considerable system and care. This part of the operation may be safely and easily accomplished by the aid of phosphorous chargers or phosphorizers made of plumbago. The Jos. Dixon Crucible Co., of Jersey City, N. J., which makes plumbago goods in great variety for metallurgical purposes, also makes these phosphorizers in different sizes, suited to the size of the crucible in which the fluxing is to take place.

He Had One.

A highly honored citizen of Portland, says the Portland *Express*, who has worked his way up from the foot to the top of the railroad ladder, and who has been a gentleman in every sense of the word in every station he has filled, relates the following incident in his career years ago, while a conductor: One morning he had for a passenger on his train a lady whom he had happened to meet socially a few evenings before. She was somewhat of an aristocrat, and it was evident that she did not intend to recognize in the conductor the acquaintance she had thus made by chance. It was in the days when the tickets on the road were of stiff cardboard, and of a size which led to the ludicrous mistake the woman made.

As the conductor approached, she turned to look out of the window, so that she might not be exposed to any risk of an attempt on the part of the conductor to presume upon his introduction. Upon the request, "Ticket, please?" without looking at the conductor or at what she handed to him, she held out what she supposed was her ticket. Imagine her surprise, chagrin and vexation when, upon his polite reply, "Thank you madam; I have one of my own," she turned, to find that she had handed the conductor, instead of a ticket, a fine-tooth comb! It may well be supposed that all aristocratic affectation and hauteur at once disappeared in her confused apologies for the mistake. She was assisted in this by the gentlemanly conductor.

Hartshorn Car Shade Rollers.

The special car shade rollers manufactured by the Stewart Hartshorn Company, of Newark, N. J., are pronounced to be absolutely what is needed along this line. These rollers are built with particularly effective springs and rarely get out of order or jam, which is so annoying in many cases. The Hartshorn Company report a business much beyond that of last year and are decidedly hopeful for the coming months.

Success of a Peaceful Strike.

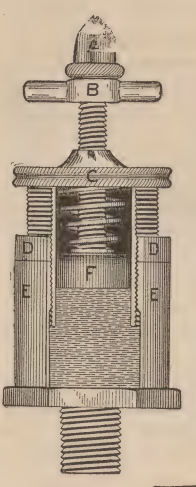
It is reported that the managers of a large foundry recently attempted to compel their molders to remain in the works until the regular quitting time on days when they had taken off a heat, the men having been accustomed to leave after that work was done. When the issue was made the men struck. New men were hired to take their places. Contrary to usual strike methods, no attempt at violence was made. Obstructive tactics were, however, employed. The men were not disposed to see their places filled by others. They managed to interview the new hands and convince many that it was wrong to take their places. Perhaps some forcible talk may have passed on such occasions, but it does not appear on the record. The company finally became tired of breaking in successive gangs of new men, and the strike ended after a short conference between a committee of the men and some representatives of the company, which was conducted in the most friendly manner. The company had been vanquished, and gracefully surrendered. In the language of a local paper, during the entire strike "the men were acting like gentlemen," and their splendid conduct was an important factor in obtaining a favorable settlement.

Frank James, the once notorious desperado, train robber and highwayman, is now a ticket-taker at one of the St. Louis theaters.

The Board of Aldermen of Brooklyn has decided that all trolley cars must be fitted with safety fenders. A fine of $50 is to be imposed for violation of the order. A resolution was adopted that no open cars be allowed when the temperature is below 60 degrees Fahrenheit.

The Santa Fe, Prescott & Phœnix Ry., whose shops are at Prescott, Ariz., is making a material addition to its rolling stock. It is now building six first-class coaches four combination cars, six cabooses, 25 box cars and 50 flat cars.

Automatic Compression Grease Cup.



The accompanying illustration shows France's patent grease cup for automatic and compression action combined, which is sold by the Henry C. Ayer & Gleason Co., of Philadelphia, Pa. The cup shown is designed for use on locomotives, but other forms are made for various other purposes. By screwing down *C* the spring is compressed and the tension maintained invariably; *F* is a cup-shaped leather plunger, tight at all times; *D* is a lock nut. The cup can be managed for refilling entirely by hand, thus avoiding the use of wrenches. The pressure being adjustable and uniform through the whole stroke, either hard or soft grease can be used without choking the feed.

On an Irish railway.—I say, guard, how is it we're going so fast to-day?

Why wouldn't we, sor? Sure we've got the wind behind us.

Improved Brake Shoes.

The Sargent Company, of Chicago, has issued a well illustrated pamphlet entitled "The Wheel, the Rail and the Shoe." The purport of its contents shows that a well designed brakeshoe will not add to the rail wear of wheels, but will materially lengthen the life of the tire by reducing the wear on the line of rail bearing, and will greatly increase the service between tire turning by acting on those parts of the tire untouched by the rail, maintaining the original contour or profile. A new type of brakeshoe made by this company, and called the Sargent tire-dressing brakeshoe, is designed to specially accomplish this purpose. It fits the tire and tread, and is proportioned to maintain the original outlines. It is nearly as light as the old style unflanged shoe. It has the advantage of the same area of effective bearing surface as the Ross shoe, with a reduction of 25 per cent. in weight. It has openings through the face which allow the escape of particles which would otherwise accumulate and wear the tire along that portion worn by the rail, and also allowing free circulation of air about the brakeshoe, reducing excessive heating. The company has prepared models (one-fourth size) of this new type of brakeshoe, for distribution among railroad officials who are interested in the subject, and who will make request for same.

Our Directory

OF OFFICIAL CHANGES IN DECEMBER.

We note the following changes of officers since our last issue. Information relative to such changes is solicited.

Atlanta & Florida.—W. B. Thomas is appointed Receiver.

Atlantic & Western.—R. T. Goff, Superintendent, Jacksonville, St. Augustine & Indian River, has had his jurisdiction extended over this road.

Boston & Maine.—Amos R. Barrett, Superintendent of Motive Power, has resigned, and is succeeded by Henry Bartlett.

Chicago & Northwestern.—Wm. Smith, Superintendent of Motive Power, has resigned, and is succeeded by Robert Quayle.

Chicago, Rock Island & Pacific.—E. St. John, General Manager, has resigned, and the duties of the General Manager are assumed by Third Vice-President W. H. Truesdale.

Cincinnati, Jackson & Mackinaw.—F. B. Drake is appointed Receiver.

Elgin, Joliet & Eastern.—John Horrigan is appointed Master Mechanic, vice J. F. Sechler, resigned. E. T. Carlton is appointed Master Car Builder.

Georgia Midland & Gulf.—John F. Flourney is appointed Receiver.

Interoceanic.—E. V. Sedgwick is appointed Superintendent Motive Power; office, City of Mexico.

Kingston & Pembroke.—Joseph Baldwin is appointed Receiver.

Lake Shore & Michigan Southern.—L. E. Johnson is appointed Superintendent of the Michigan Division.

La Porte, Houston & Northern.—T. W. Ford is appointed General Manager. Office, La Porte, Tex.

Montreal Island Belt.—John P. Mullarkey has been appointed General Manager; office, Montreal, Canada.

New York & New England.—J. M. King is appointed Superintendent of the Providence Division.

Ohio River.—General Manager G. C. Gardner has resigned.

Pennsylvania.—Wm. N. Bannard, Superintendent at Altoona, Pa., has resigned.

Quincy, Omaha & Kansas City.—General Manager Amos Green has resigned.

Roaring Creek & Charleston.—T. B. Phillips is appointed Receiver.

Sebasticook & Moosehead.—Z. D. Lancaster is appointed President and General Manager, vice W. Van Wart.

South Jersey.—Henry Wood is appointed Manager; M. F. Bonzano is appointed Assistant Manager.

Staten Island Rapid Transit.—Frank S. Gannon is appointed General Manager.

Toledo, Ann Arbor & North Michigan.—Superintendent of Motive Power W. F. Bradley is appointed General Superintendent.

Western & Atlantic.—George M. Brown is appointed Receiver.

Williamsport & North Beach.—R. E. Eavenson is appointed General Manager.

Wanted.

WANTED—By a large manufacturer, some new specialty, to manufacture for the railroad trade. Address "ADVERTISER" care of the NATIONAL CAR AND LOCOMOTIVE BUILDER.

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NATIONAL CAR AND LOCOMOTIVE BUILDER

FEBRUARY, 1895.

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The Southern Railway is receiving bids for the building of 500 box cars.

About 50 flat cars are to be built at the Linton shops of the C., C., C. & St. L.

The Pennsylvania Railroad has contracted for 30.000 tons of steel rails at $22 per ton.

The Baltimore, Ohio & Southwestern, it is announced, is going to build 300 stock cars.

A new passenger station is to be built by the M., K. & T. at Sedalia, Mo., to cost $30,000.

The Wisconsin Central is building 50 platform cars at its own shops to fill vacant numbers.

It is reported that the Kansas City Provision Company is about to order 50 refrigerator cars.

The Cold Blast Transportation Company, of Kansas City, Mo., is about to order 100 freight cars.

The Norfolk & Western has ordered 500 box cars of the Central Car Trust Company, of New Jersey.

The Columbus, Hocking Valley & Toledo has ordered 100 freight cars from the Pullman car works.

The Delaware & Hudson Canal Company is reported as about to order a number of freight locomotives.

"Bill" Cook, the notorious desperado and train robber, was captured near Fort Stanton, N. M., Jan. 11.

The Missouri Car & Foundry Company has received an order from Armour & Co. for 200 refrigerator cars.

The West End Street Railway, of Boston, is reported as about to order a large number of open summer cars.

The Cleveland, Cincinnati, Chicago & St. Louis will build extensive new shops at Wabash, Ind., next spring.

It is announced that the Cleveland, Lorain & Wheeling contemplates ordering six or eight locomotives in the spring.

The Goyer Tank Line Company has placed an order with the Memphis Car and Foundry Company for a number of tank cars.

The Duluth, Missabe & Northern is reported as about to enter the market for some new locomotives and a number of ore cars.

Two decapod locomotives were recently shipped to the the Trans-Caucasia State Railway by the Baldwin Locomotive Works.

The President of Mexico has approved the contract for the construction of a railroad between the States of Puebla and Vera Cruz.

The Pennsylvania Railroad is going to build a two-story repair shop at Wilmington, Del. It will be 60 feet long and 40 feet wide.

The Boston & Maine is receiving bids for the building of 29 passenger and baggage cars which it contemplates ordering before long.

The Cleveland, Cincinnati, Chicago & St. Louis will soon order about 6 locomotives, 500 box cars, 300 coal cars and 500 platform cars.

It is announced that the Pennsylvania Railroad will build 20 locomotives at its Altoona shops this year for use on the Southwest system.

The Duluth & Iron Range Railroad has decided to order immediately 400 ore cars of either the Wells & French or Pullman Car Company.

It is announced that Messrs. Flint & Co., of 68 Broad street, New York, are asking bids on freight and passenger cars for South American railroads.

The statement of the Atchison, Topeka & Santa Fe for the second week in January shows an increase of $16,817 over the corresponding week of last year.

Eastbound shipments from Chicago continue to increase. For the week ending Jan. 21 the total was 43,588 tons, an increase of 1,742 over the previous week.

The Southern Railway will soon make some additions to its shops at Atlanta, Ga., and will establish a large storehouse there for the distribution of supplies.

The Allison Manufacturing Company, of Philadelphia, Pa., has received an order for a number of cars from the Charleston, Clendennin & Sutton Railroad.

The Government of Denmark has recently issued a loan of 25,000,000 crowns (about $7,000,000), which is destined for the payment of old debts and the building of railroads.

The earnings of the Chicago, Milwaukee & St. Paul Railway for the third week of January were $443,406; for the corresponding week of 1894, $498,674; decrease, $55,268.

The Memphis Car and Foundry ompany, of Memphis, Tenn., is now building a number of tank cars for the Crescent Oil Company, also the Goyer Tank Line Company.

The car sheds of the Boston West End Street Railroad Company were burned on the night of January 16, together with 60 cars and other property. Loss about $105,000.

The *Journal of Commerce* estimates the fire losses of the United States and Canada for the year 1894 as $127,450,000. The 1893 losses were $156,445,875, and those of 1892 $132,704,700.

The freight sheds, a pier and a number of freight cars and contents belonging to the Long Island Railroad were destroyed by fire Jan. 10, at Long Island City. The loss is estimated at about $50,000.

The Wisconsin Central will soon begin equipping 600 ore cars with M. C. B. couplers and Westinghouse airbrakes. It is said that the make of coupler to be used for these cars has not yet been decided on.

The Missouri, Kansas & Texas has issued the specifications for the 2,000 new freight cars it is about to order. As announced in our last issue, these will include 500 coal cars, 700 furniture cars and 800 box cars.

On the night of Jan. 12 a passenger on a Lake Shore & Michigan Southern train was assaulted and robbed by two men as he was passing from one car to another, and was then thrown from the running train.

The order of the Buffalo, Rochester & Pittsburgh for 200 cars, announced as about to be issued in the NATIONAL CAR AND LOCOMOTIVE BUILDER for January, was awarded to the Union Car Company, of Depew, N. Y.

The Unadilla Valley has ordered 10 freight cars of the Carlisle Manufacturing Company, of Carlisle, Pa., an 8-wheel passenger engine of the Rhode Island Locomotive Works, and two second-hand passenger cars of the New York Equipment Company.

It is announced that the car shops of the Kanawha & Michigan Railroad, now located at Corning, O., and Charleston, W. Va., are to be moved to Point Pleasant, W. Va. This town is to be made the division headquarters because of its central location.

The Merchants Despatch Transportation Company has ordered 150 cars of the Union Car Company, of Depew, N. Y., and the same number of Michigan Peninsular Car Company. These cars are to be supplied with the insulating paper manufactured by the Standard Paint Company, of New York. The amount of material ordered is 414,600 square feet of 2½ ply giant P. & B. paper.

A rear collision of freight trains on the Lehigh Valley Railroad, January 5th, at Whitehaven, Pa., resulted in the death of two drovers, and the killing of 60 sheep that were confined in one of the cars. The drovers were asleep in the caboose at the time of the accident, and it is said that the body of one of these was found forced into a cylinder of the engine that caused the collision.

California dispatches of January 22 announce that a severe snowstorm was raging on the line of the Central Pacific Railroad for the previous 24 hours, the snow being 22 feet deep on a level at the summit of the Sierra Nevada Mountains, near Truckee. On the Shasta route a formidable avalanche of snow occurred at Upper Soda Springs, near Dunsmuir, Cal., burying the track 60 feet deep under snow, bushes and rocks.

The fixed charges of the Baltimore & Ohio Railroad Company, due Jan. 1, were paid without borrowing a dollar. This shows the excellent financial condition of this company. President Mayer says that the road has not had such a small floating debt for 15 years as it has now.

Mr. John W. Cloud, Secretary of the Master Car Builders' Association, has been granted a patent for a car spring of his design. The invention consists of the combination of a main spring, and an auxiliary spring which is screwed into the coils of the main spring when the same is slightly closed, so that the auxiliary spring is brought under an initial strain acting in opposition to the main spring.

Some of the labor organizations have been looking forward with much eagerness to the election of officers of the Lehigh Valley Railroad. They hoped for the defeat of President E. P. Wilbur on account of the late strike on that road. The election took place in Philadelphia, Jan. 18, and the judges of election reported that 515,105 votes had been cast for Elisha P. Wilbur for president, and 182 for John Wanamaker for the same office.

Five hundred shopmen of the Union Pacific between Council Bluffs and Cheyenne have been laid off. Of this number 360 were at the Omaha shops. Master Mechanic Mannings says the men will be put back as soon as business will warrant. The men remaining in the shops continue to work eight hours a day five days a week. The Missouri Pacific has also begun to retrench. Half the men in the Sedalia shops are to work alternate weeks.

A passenger train on the Terre Haute & Indianapolis was ditched 26 miles from Indianapolis, Jan. 28, by spreading of the track on a curve near Catsville, Ind. The private car of President McKeen, the parlor car and the ladies' coach rolled down an embankment. Two passengers were killed and about 30 injured, 18 seriously. One of the killed was John W. Norton, the theatrical manager who brought out Mary Anderson on her first public appearance at the old De Bar's Opera House in St. Louis.

The Chesapeake & Ohio has ordered 100 stock cars of the Ensign Manufacturing Company, of Huntington, W. Va. They are to be built according to plans made by Mr. W. S. Morris, Superintendent of Motive Power of the road named. They will have the most improved arrangements for watering and feeding cattle in transit, and are to be arranged for carrying coal and other heavy freight on the return trip. They will have the Westinghouse air brake, Janney couplers and National Hollow brakebeams.

An eastbound passenger train on the Terre Haute & Indianapolis ran into the engine of a freight train on the C., C., C. & St. L. road at the crossing of these two roads near Columbus, O., Jan. 24. It is said that the passenger engine was running 30 miles an hour at the time of the collision. It struck the freight engine squarely in the side, throwing it over and carrying several freight cars with it. The passenger engineer was badly hurt in jumping from his engine, which shows that he must have been running pretty fast. The old excuse that "the airbrakes failed to work" is given.

President George B. Roberts, of the Pennsylvania Railroad, has issued a notice to the officials of the company's system, drawing their attention to provisions of the new constitution of New York forbidding the issue of free passes to any person holding a public office, and cautioning them to obey the law. President Roberts has also ordered a general retrenchment in the matter of free transportation over the Pennsylvania system. The liberality of the company, he says, has been abused, and the abuse must end. As a consequence of this move, the number of annual passes for 1895 is much smaller than heretofore.

A bill has been introduced in Congress to incorporate the National Central Railway Company. This company entertains the modest intention of building a railroad from New York City to San Francisco by a route that will be 600 miles shorter than any other. According to the plans proposed the road is to be constructed in the most improved manner and of the best materials known in the art of railroad building. The capital stock of the company is to be $400,000,000. If the company so elect, the Government is to guarantee the interest upon the bonds sold to aid in the construction of the road. It will be cold weather in Panama when this scheme succeeds.

Those who ride on elevated railroads are doubtless often impressed with the thought of what a dreadful accident would result if a train should plunge to the street below. Happily, accidents are rare on these railroads in the air, but the dreaded event finally happened January 10th, on the Kings County Elevated Railroad of Brooklyn. The accident was due to the engine carrying away the bumper placed at the end of a sidetrack where trains were switched. The bumper appeared to offer no obstruction, and the engine, followed by one car, glided off the ends of the rails and dropped with a tremendous crash into the street. The fireman was killed and the engineer was badly injured.

Standard Locomotive Boiler, Chicago & Alton Railroad.

The following engravings reproduce the general arrangement drawings of a newly designed boiler that is intended to be the standard for the new Class E engines of the Chicago & Alton Railroad. These engines are to be of the 8-wheel type, with cylinders 18 inches by 24 inches. They will be built according to designs made by Mr. Jacob Johann, Superintendent of Machinery of the road. Mr. Johann has devoted special attention to the construction of the boiler, with the view of making it as strong and durable as possible. The drawings show that this attention has resulted in the design of a boiler of unusual strength and stability. In the first place it is made a true cylinder in all parts where it is possible to so construct it, the aim being to avoid flattened surfaces wherever practicable; and the wagon top is extended so as to admit of the dome being placed ahead of the firebox, thus permitting the thorough and positive staying of the crown sheet with radial stays over its entire surface.

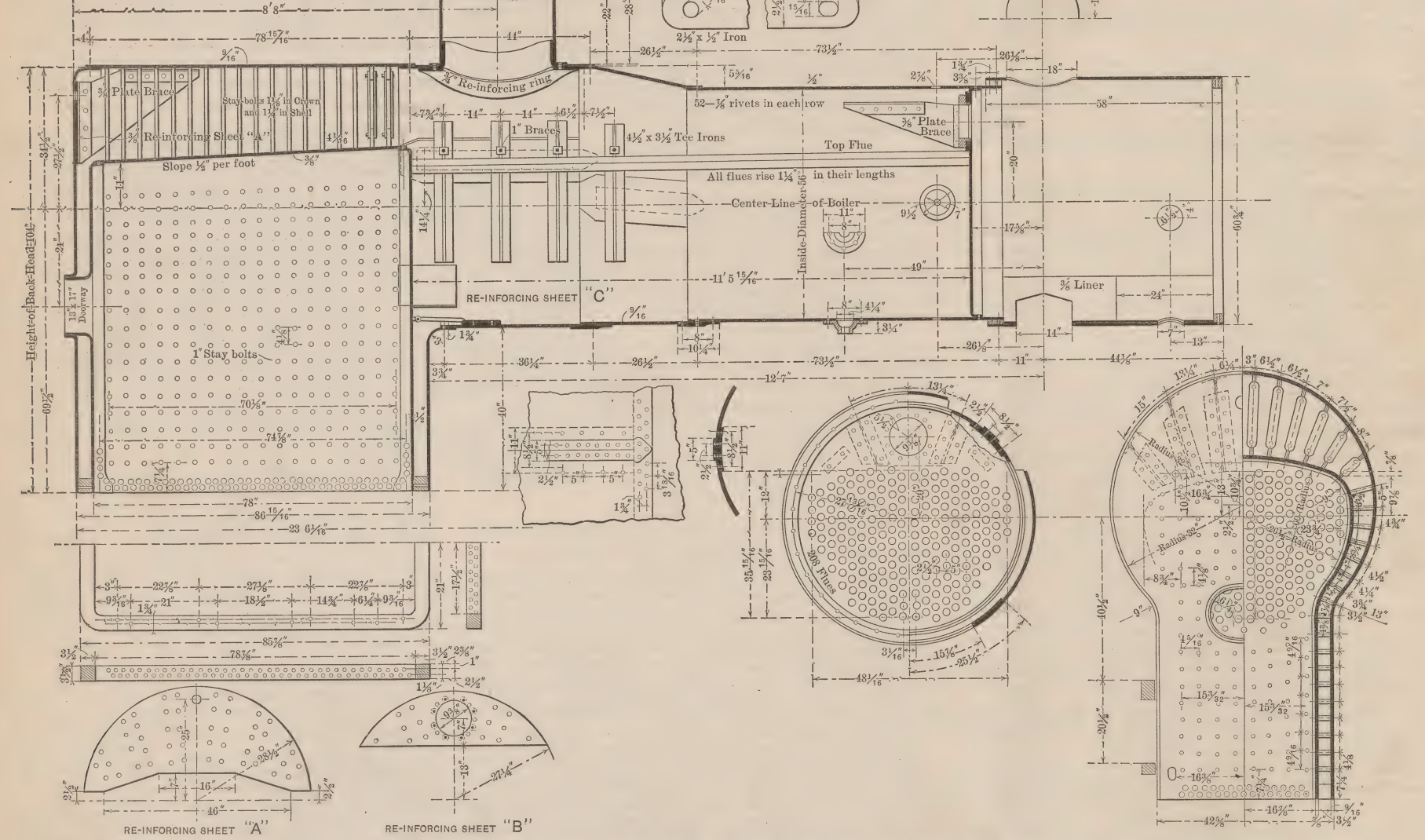
As will be noticed, sling stays supplant solid staybolts for the first two rows supporting the front of the crown sheet. These stays are of iron, 1 inch by 2½ inches, and of the construction shown in the drawings, the top hole being round and $\frac{15}{16}$ of an inch in diameter, while the lower hole is oblong, being 1¼ by $\frac{15}{16}$ of an inch. This permits of vertical movement of the portion of the crown sheet supported by these stays. When a boiler is fired up the flue sheet of the firebox, which is exposed to the direct and most intense action of the fire, gets hot and expands before the surrounding sheets, and as it is held rigidly at the bottom its movement must be upward. The use of sling stays with slotted pinholes at the lower ends, in place of solid staybolts for the first two rows at the front of crown sheet, allows for this movement without the bending of the crown sheet at the first row of stays, which constant bending has caused the cracking of many crown sheets. When the boiler gets hot under pressure and the temperatures of the different parts become normal, these stays come into action as tension braces. Somewhat similar stays are placed longitudinally at the throat and make a flexible connection between the flue sheet and the shell of the boiler.

The boiler is re-enforced in an effective and yet in an inexpensive way at several points where weaknesses frequently develop. For this purpose re-enforcing sheets *A* and *B*, shown in the drawings, were designed. Sheet *A* is placed on the interior of the upper part of the back head sheet, and sheet *B* is placed on the interior of the upper part of the front flue sheet. Instead of the old round iron stays for bracing the back head and front flue sheets, Mr. Johann uses ⅜-inch plate braces at these parts, as shown in the drawings. Another point where weakness frequently appears is in the throat sheet on each side just at the junction curves, and the "re-enforcing sheets *C*," which are made to conform to the inside of the sheets to which they are fitted, are put in to give additional strength here.

After some years of service, boilers are generally found leaking in the lower part of the circumferential seams of the shell, and the welt strips shown in drawing, which cover the lower third of the circumference of the boiler at each of these seams, are put in to strengthen them and avoid this trouble.

The inside diameter of this boiler is 56 inches at the smallest ring. The outside diameter of the smokebox is 60¾ inches, and its length is 58 inches. The boiler is 23 feet 6 1/16 inches, from the face of the back head to the front face of the smoke arch ring. The height of the back head is 104 inches. The firebox is 78 inches long, and the width is 33¾ inches. The grate area is 18.28 square feet. The firebox heating surface is 148.6 square feet, and that of the flues is 1,252.4 square feet, the total heating surface of the boiler being 1,401 square feet. The boiler contains 208 tubes 2 inches in diameter and 11 feet 6 inches long. The boiler is made of steel, the back-head, front course and flue sheets being ½ inch in diameter, the throat, dome and waist sheets are $\frac{9}{16}$ inch diameter, as are also the top and bottom connections. The dome and the side and back firebox sheets are ⅝ inch in diameter. Where practicable, large sheets are used in the construction of this boiler, as the following dimensions will show: Backhead, 111 inches by 78 inches; smoke arch, 192 inches by 59 inches; front course, 179 inches by 79 inches; waist sheet, 115 inches by 50 inches; inside side sheet, 215 inches by 81 inches; outside shell, 253 inches by 82 inches.

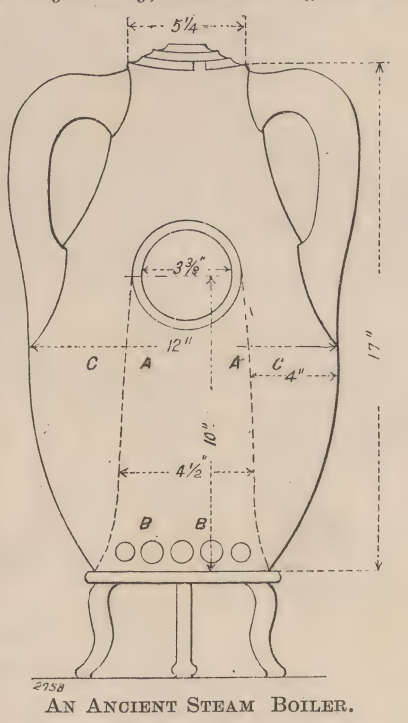
A study of the drawings will reveal numerous other points of interest in this boiler which we have not space to mention here. It will be noticed that the water space at at the sides of the firebox is 3½ inches. The fire door opening, it will be seen, is oval in shape, being 13 inches high and 17 inches long. This may not strike some as being a matter of much importance, but we would invite special attention to it in the interests of fuel economy. This doorway, being of the shape it is, is amply large to enable a fireman to throw the coal on any portion of the fire, and yet the opening of the door does not permit a vast volume of cold air to rush into the firebox and get in its deadly work on the flue sheet and



Standard Locomotive Boiler, Chicago & Alton Railroad.

A Boiler 2,000 Years Old.

The drawing reproduced herewith shows the form and arrangement of a relic of Pompeii that in its time was used as a steam generator. The drawing was made by a correspondent of *Engineering*, from the original relic now in



AN ANCIENT STEAM BOILER.

the custody of that section of the museum at Naples, Italy, devoted to objects found in the ruins of Pompeii, which city was destroyed by the great eruption of Vesuvius, Aug. 24, A. D. 79.

As this writer says, the water-tube boiler in which the fire is applied externally is sometimes spoken of as a modern invention, and the invention of the internal fire-box is considered by some to belong to the time of Watt, but this boiler shows that the principle of internal firing was known about 2000 years ago.

Among other objects found at Pompeii was this boiler of sheet metal, probably copper. Its form is similar externally to several vases of silver found at Pompeii, but internally it is furnished with a cylindrical firebox *AA*, surrounded by a water space *CC*. The firebox is curved at its upper end and terminates in the side of the vase. The lower end of the firebox is furnished with five fire-bars *BB*; each bar consists of a tube in communication with the water space. The internal diameter of each tube is about ¾ inch. The fuel used appears to have been charcoal, as fragments of it have been seen in other heating vessels found at Pompeii. The boiler is furnished with a closely fitting lid, and the whole is supported on three legs of beautiful bronze figures.

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Steam Hammer Tools.

BY JAMES F. HOBART.

The railroad shop steam hammer varies with the shop it is located in so much that, while in one shop it is tested each week and the anvil die trued up so that a piece of medium thick paper will he held between hammer and anvil, try it where you will, in other shops there is a distance of ⅜ inch between hammer and center of anvil. Imagine a smith trying to do good work on such a hammer. He might as well try to forge under a pile driver. The paper test is the thing. When the die gets worn so badly

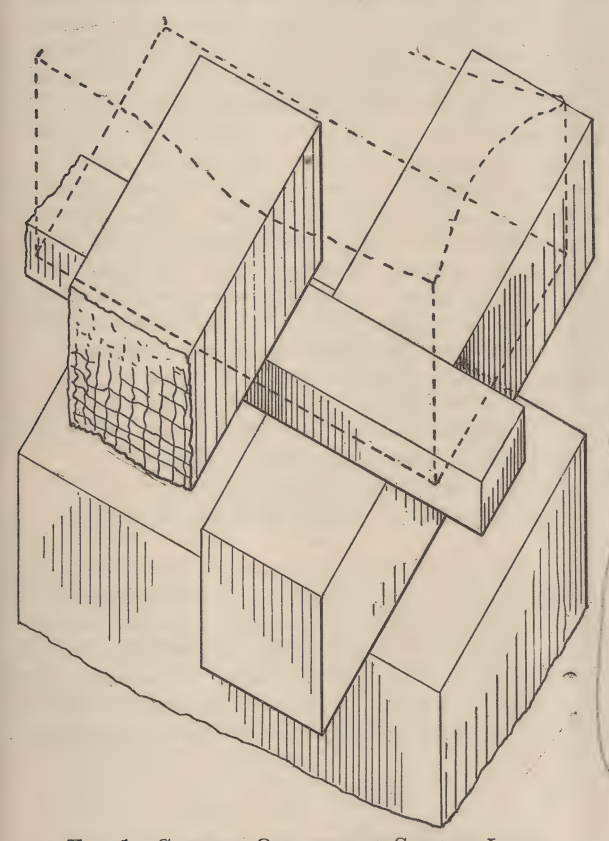


FIG. 1.—CUTTING OFF WITH A SQUARE IRON.

in the middle that the hammer will not hold a piece of paper, then knock out the die and give the grinder a job.

A few simple tools should go with every steam hammer. They help things a good deal. For instance, who would want to cut up stock with two pieces of square iron, as shown by Fig. 1, when it could be better done with a bit of three-cornered steel, as shown in Fig. 2? Yet it is done every day, and some shops do all the cold cutting of iron less than ¾ inch thick with just such a crude arrangement. The objection is sometimes raised that the tool shown by Fig. 2 is apt to damage the hammer. It will do this should the hammer man be careless enough to strike the tool direct;

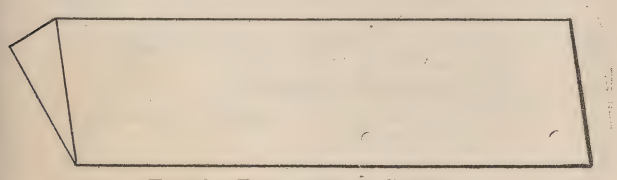


FIG. 2.—TRIANGULAR CUTTER.

but like many other tools, the steam hammer needs a good man as runner, on purpose to take care of it and to use it properly.

The tool shown by fig. 3 is so made that the hammer cannot be damaged even if the cutter is struck a direct and heavy blow. The tool is about 8 by 4 by 2 inches. The cutter (*a*) is simply a piece of three-cornered steel. The holder is wrought iron. There are several ways of putting a cutter into the holder. Sometimes the cutter is fitted a little too long to go in between the shoulders, then the holder is heated, the tempered cutter slipped in place, and the whole business dropped into the water box till

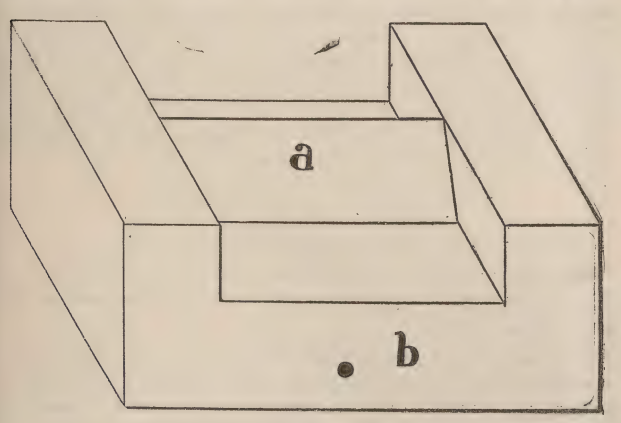


FIG. 3.—CUTTING OFF TOOL.

cold. Sometimes the cutter is brazed in, but the best way is to take a piece of Mushet's or Park Bros.' "air hardening" steel, and weld it right into the holder, then the thing will stay where it belongs and may be used even after the steel has been cracked through by heavy use.

A good "top tool" for cutting large cold iron is shown by Fig. 4. It is made of steel, and is 4 inches long in the cutting part, and the cross section is diamond shaped with the top part cut off where the hammer strikes, as shown in the engraving. But the vital point of this and similar tools lies in the peculiar shape given at (*a*). Here the tool is forged out rather thin, and wide enough to give the re-

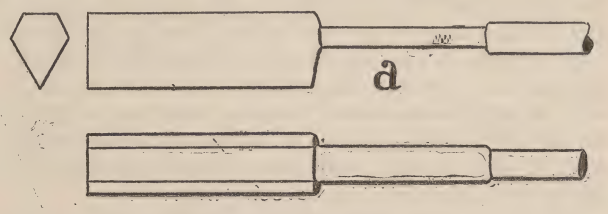


FIG. 4.—COLD CUTTING TOOL.

quired strength. The part acts as a spring, and takes up the shock imparted by the hammer. If the tool was made stiff at (*a*) and full size, it would break off in a very short time.

One of the worst things that can be done on a steam hammer is to draw down a weld lap on one end of the

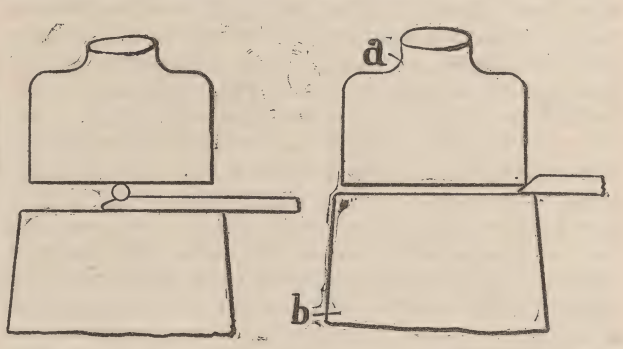


FIG. 6. FIG. 5.

WELDING LAPS.

anvil, as shown by Fig. 5. The work is so far out of center that the rod packing cannot be kept tight, the hammer is strained, and the anvil die is raised from its bed at (*b*). There is also danger of breaking the rod at *a*. All this trouble can be avoided by using fullers, as shown by Fig. 6. The work can be done then as quickly, just as well, and without straining the hammer.

The New Union Station at Boston.

The conveniences for handling cars are very complete in this elegant terminus. The twenty-four tracks are all furnished with Ellis' track buffer, which receives a car so that the shock of impact is received upon the buffer and truck both, but upon the truck only sufficient to overcome the momentum of that body. Undue strains in cars are thus prevented in theory, if not in fact. Each buffer is fitted with steam and air connections, so that the cars may be heated and the brake cylinders charged at any time. Instead of the regulation hose connection for steam at the buffers I noticed W. H. Hampson's patent universal joint connection for all the tracks.

In constructing the new station the old "Eastern Depot" was demolished, and upon its site one corner of the new building was erected, the building extending along Causeway street to the "Boston & Lowell" Station, which has been made a part of the new structure. Six tracks are contained in that old building, and, the roof being built on a modern arch, the brick wall on the east side of the building was removed without disturbing anything else, thus throwing the old right into the new building.

Each track is long enough to accommodate eight and a half cars besides the locomotive. The tracks are arranged in pairs, so the passengers and baggage facilities occupy alternate platforms. The roof of the new building is supported by iron pillars placed between each pair of tracks, and for convenience a telephone to the train starter is placed upon each post. The starter is very conveniently located in a little office perched almost in the roof of the station and reached by a flight of "corkscrew" (library) iron stairs.

The car inspector has a letter-box bolted to one of the columns; and a box for register slips of the Wagner Palace Car Company is affixed to buffer No. 12. Independent news tables are placed at buffers Nos. 2, 9, 12 and 15, so that passengers entering the cars need not go to the regular news stand in order to purchase their favorite papers before entering the cars. Each train has its destination and time of departure designated by adjustable clock hands and large placards displayed under the dummy clock dials. A large number of placards are required to cover the various destinations of the hundreds of trains that leave the Union Station every 24 hours, and these placards are stored in chests much like those used by carpenters for containing their tools. To prevent loafers or passengers from utilizing these chests as settees, a row of very sharp brass spikes one and a half inches long is placed all around the outside edge of the chest cover, making sitting thereon very uncomfortable, to say the least.

Incoming trains usually use the left-hand tracks, those in the old "Lowell Station" being mostly used for that purpose. The baggage-room (inward) is located at that side of the station, while the "outward baggage" is taken care of at the other side of the building. Passengers do not have to go out in the street to take a cab or a carriage, as an ample vehicle stand has been provided under cover in the center of the building, the driveway leading directly upon Causeway street. This point will be appreciated by the passengers, as they do not have to cross a crowded sidewalk; neither are they forced to embark in downpours of rain or snow. The postal cars discharge their cargo directly into mail wagons on a side street, the baggage platforms being used for that purpose also.

A Disastrous Explosion.

A warehouse situated near the freight-yard of the Montana Central Railway at Butte, Mont., caught fire Jan. 15, and the fire was communicated to some freight cars standing in the vicinity, several of which contained powder. The warehouse itself contained, according to the owners, 150 pounds of giant powder. As the fire spread, three tremendous explosions followed each other at short intervals. A large force of firemen and spectators were present. Fifty-three were killed and 85 were injured. The bodies of four of the firemen were not recovered, and are believed to have been blown into fragments. Eight other firemen were killed. The concussion of the explosion broke the windows of the houses within a radius of many miles and shook houses in Belgrade, 84 miles east of Butte. The financial loss by fire and explosion in the immediate vicinity of the disaster is $163,200. From all that can be learned, the total amount of explosives that went up in the three explosions was nearly 30 tons. There were 20 tons of giant powder alone that went up in one blast.

Palace Street Cars.

The West End Company of Boston controls a number of street railway lines that radiate from "The Hub" in many directions. A ride over all these lines makes quite an excursion. A practice that has existed for some time in Boston is the chartering of special cars by excursion and theater parties who do not want strangers intruding on their fun. An ordinary car could be secured for the day or night, as the case might be, on payment of $8. That sum secured the car for the exclusive use of the party, whether it contained one of fifty persons. Having discharged its freight the motorman and conductor took the car to the nearest siding to await the return of the excursionists. If the party went out merely for a moonlight ride, the motorman and conductor were, for the time being, servants of the leaders of the party. Such a car had a roving commission and could go wherever the excursionists desired, provided they did not want to go into a territory beyond the jurisdiction of the West End Company.

During the past summer there has been such a rapid increase in the demand for such cars that the company negotiated with a manufacturer for two special cars to be equipped regardless of expense. They were put in commission recently and have attracted much attention. They are veritable palaces. Each car is 20 feet long by 7 feet 4 inches wide. The motors are of 25 horse power each. The outside colorings are black and gold, relieved with crimson in the panels. The running gear is painted a dark green. Inside, the woodwork is of polished mahogany and the upholstering is of peacock-blue brocaded plush. There are 20 armchairs, each equipped with a wire hat-holder. The doors are double and give sufficient space when opened for the passage of a lady in full evening dress without danger of crushing or soiling her wardrobe. The frescoing and electric fixtures are in keeping with the refined elegance of the interior furnishings.

These cars may be chartered by any reputable party that wants to pay $15 for a car ride. The West End Company expects to have such a demand for these cars that others must be supplied before the winter is over. The experiment has been made solely because of the popular interest in trolley parties.

Iron Production in 1894.

The American Iron and Steel Association has received from the manufacturers complete returns of the production of pig iron in the United States in 1894, and also complete returns of the stocks of unsold pig iron in the hands of makers or their agents at the close of the year. The total production of pig iron in 1894 was 6,657,388 gross tons, against 7,124,502 tons in 1893, 9,157,000 tons in 1892, 8,279,870 tons in 1891, and 9,202,703 tons in 1890. The production in 1893 was 2,032,498 tons, or over 22 per cent. less than in 1892; and the production in 1894 was 467,114 tons, or over 6½ per cent. less than in 1893. The total production of pig iron in 1894 was the lowest yearly production since 1888.

The number of furnaces which were in blast on June 30, 1893, immediately after the panic of that year, was 226; by Dec. 31, 1893, the number in blast had fallen to 137; on June 30, 1894, there were only 108 in blast; on Dec. 31, 1894, the number in blast had increased to 185. The stocks of pig iron which were unsold in the hands of manufacturers or their agents on Dec. 31, 1894, and which were not intended for their own consumption, amounted to 567,688 gross tons—an increase from June 30 of 80,652 tons.

A Sufferer.—"Here's a feller," said Plodding Pete, who had been indulging in literature, "wot says dere's too much labor agitation in dis country." "Dat's wot dere is," replied Meandering Mike. "I suffers from it meself. Every time I think of labor it agitates me."—*Washington Star.*

Saturated Waste for Oiling Cars.

According to *Railway Engineering and Mechanics*, Mr. B. Haskell, Superintendent of Motive Power of the Chicago & West Michigan, furnishes saturated waste instead of oil for oiling cars. To prepare this waste he has built a special tank. It is circular and will hold about six barrels of oil. A coil of steam pipe is run around the inside of the tank, and a shelf of stack netting is secured on one side. About two barrels of oil are put in the tank and waste enough to absorb that quantity of oil. Steam is turned on and the oil heated slightly, making it thin enough to be absorbed readily by the waste. It is then allowed to soak for at least twenty-four hours, and, after being again heated, the waste is put on the shelf to drip. The second heating is to make the waste drip more quickly than it otherwise would. A little experience in heating the oil will enable the operator to prepare it so that the oil will drain from the waste without any handling or pressing. It has been found so convenient that since the plan has been adopted the trainmen are not given oil, but saturated waste instead, and the cost of oiling cars has been greatly reduced thereby.

Temperatures Injurious to Food Products During Transportation.

Under the above heading, Mr. H. E. Williams, Chief Clerk of the Forecast Division of the United States Weather Bureau, has issued a bulletin of which the following is a synopsis: The temperatures at which perishable goods are liable to damage vary greatly with diffent commodities, their condition when shipped, how long they may be in transit, whether they are kept continually in motion, etc. Injury is liable to occur from long exposure to a temperature below 32 degrees, or from a shorter exposure to a greater cold, so that the duration, as well as the intensity, of the cold must be considered. The degree of cold to which perishable goods may be subjected without injury depends on the time the shipment will be on the road; also, whether it will be unloaded immediately upon arriving at its destination or allowed to stand some time also direction of shipment, whether toward a cold area or away from it.

If refrigerator cars are not used, meat should be wrapped in burlaps and the carcasses hung so as not to touch each other. With an outside air temperature of 50 degrees, or below, in dry weather, meat that has been thoroughly cooled will keep a week if shipped in an ordinary box car. Pork is injured more quickly by high temperature than other meats, and greater care should be taken with it in storing and shipping. Sudden changes in temperature of from 10 degrees to 20 degrees are very injurious to green meats and should be provided against when possible.

It is stated that for the shipment of fruit the ordinary refrigerator car is not entirely satisfactory, and that there is a strong demand for a better refrigerator car than can now be obtained. A car is wanted that will carry oranges, bananas. etc., without danger of chill through the coldest climates of the country, as the delays in housing are injurious to the keeping properties of the fruit, and the dealer is also kept out of the use of his goods.

In connection with the storage and shipment of food products liable to injury by heat or cold, much benefit may be derived from an intelligent use of the information contained in the daily weather reports and forecasts published by the Weather Bureau, which show the probable conditions that will prevail during the next 36 hours.

Newspaper Making.

An interesting discourse on the art of modern newspaper making was delivered by Mr. Charles A. Dana, editor of the New York *Sun*, before the officers and students of Cornell University at Ithaca, N. Y., on the anniversary of "Founders' Day," Jan. 11. He said that the newspaper profession is one in which the utmost amount of learning can be put to use, but that there are newspapers in which learning is very sparingly applied. A newspaper is very much like human nature: It is right sometimes, and it is wrong pretty often. But there is no question that the newspaper is a useful, advantageous and beneficial institution. Great changes are now in progress in the newspaper business. These changes are due, first, to the invention of new printing machinery, which makes it possible to publish the large editions and the large newspapers now common. Improved presses can now turn out at one impression large sheets of 8, 10 or 12 pages, and deliver 20,000 finished papers in an hour. Before these machines were invented it was not possible to do this, and an old-fashioned press that could turn out 600 or 700 copies a day from the hands of the operator was the best there was in the world. One peculiarity of these new machines is that the papers are not only printed, and printed well, but they are folded by the machine; and, what is more, they are counted and laid out in piles of a certain number.

Type-setting machinery is now common and of various designs; the one most in use is the invention of Merganthaler, and is known as the Linotype machine. It is operated with keys, like a piano. This machine sets up the type and forms a line, just one line at a time, and then, with molten metal, a cast of that line is made, so that, instead of a mass of type, there is formed what the printers call a slug; and then another line is formed, and so on until the whole article and the whole page is put together. Then there is another machine (in which Mark Twain is interested) of exceeding delicacy, and does exactly what the human fingers do. It picks up the type and puts it in the box and secures it there, so that finally the column—the article—can be put into the form and the impression be made. It seems to do by mechanism all that a man can do. Usually the product of printing machinery is not put on the press to be printed. A stereotype plate, usually of a whole page, is made, with a curve in its shape that will fit the press, and from that the printing is done.

Of course the effect of using these mechanical typesetters is to cheapen the newspaper when it is done and ready for sale. But the great revolutionary agent is the cheapness we have reached in the cost of paper. I remember very well when paper was made of rags, and presently it became evident that the country and all countries didn't supply rags enough. The manufacturers couldn't get the rags, and so we were liable to be left without paper. Then there came along a Frenchman who invented a chemical method of making paper from rye straw; and I remember that the value of rye straw here in the interior of New York rose all at once from $6 to $20 a ton because of the demand created for it to make paper with. That, however, was not the end of the movement. The rye straw always had, after it was converted into paper, a flinty, glassy surface, and that wore the type out, so that a set of type for a newspaper, that ought to last a year, wouldn't last more than three months. But then came the great change of all, when people turned from the rye field and its straw to the forests. And now all printing paper that is used in newspapers is made out of wood; and when you pick up your paper in the morning to look at it, the probability is that you are picking up a piece of spruce tree.

Thirty years ago the cost of paper for making newspapers was 12 to 20 cents a pound; now it is 2¼ cents a pound. One pound is enough for 55 or 60 common sized pages, about five or six ordinary papers. This is a revolution of great consequence in the business of newspaper making. How far it will tend to produce any greater cheapness of newspapers, I will not now attempt to say. They are already sold very cheap considering their other expenses beside the printing and the paper, such as the variety of intelligence, the cost of getting news, the salaries of writers, correspondents and assistant editors, and the rent that must be paid in a great city for the extensive quarters that are required.

Mr. Dana said that there is impressive evidence to show that fools form a large part of any community, and so it is perfectly right to provide for these in special newspapers—a duty that is extensively performed by some individuals. The man who is going to publish a manual of news and facts and ideas and truths, or even lies, in any language, should know the language thoroughly. Otherwise he may sometimes say what he does not mean. I have known that to happen. I remember once we had in the *Tribune* a smart young fellow named Henderson. He had written something one day that Mr. Greeley didn't like. Greeley came in and said: "Henderson, did you write that?" "Yes, sir," said he. "Go away from here! I don't want you here any more; I discharge you!" The next morning I came down to the office and found Henderson sitting at his desk and working tranquilly away, as usual. I said: "How is this? I thought Mr. Greeley discharged you." "Yes, sir, he did; but I didn't put confidence in all that he said."

There is a tradition in some newspapers of the old school that you must pretend to a silly infallibility, and never admit you have been wrong. That is a silly rule. If a man has not the moral courage to say: Yes, I was wrong, and I don't now believe what I said at some former time; if he has not courage to say that,—he had better retire from business, and never try to make another newspaper.

A Remarkable Telegraph Line.

The Indian Government telegraph line from Skrinagar to Gilgit, over the Rajdiangar and the Burzil Passes, in Cashmere, was recently completed. The distance is only some 240 miles, but the altitudes crossed are very great—from 11,000 feet to 13,500 feet—and the physical difficulties encountered during its construction have been greater than in any previous undertaking of the kind by the Indian Government. The work of maintenance in so exposed and thinly inhabited a region is correspondingly arduous. On the submit of the Rajdiangar Pass the snow sometimes accumulates to the depth of 14 feet, and reaches 18 feet on the top of the Burzil Pass, which is 13,500 feet above the sea. The poles are of deodar, 30 feet long, are of unusual strength, and placed within short distances of each other. In some parts the wire is of solid homogeneous steel of abnormal tenacity, to withstand the wind pressure and the liability to be coated with snow and ice, when it forms a "rope of snow" several inches in diameter.

On Jan. 17 the Executive Council of Massachusetts, by a vote of 6 to 3, decided in favor of the petition for the pardon and release of the New York, New Haven & Hartford Railroad officials in jail at Plymouth. The Governor, who presided at the meeting of the Council, stated that he did not agree with the view taken by that body, and reserved his decision in the matter.

Street Railway Mail Cars.

At a recent meeting of the American Street Railway Association the report of the committee on mail, express and freight service on street railway cars contained some interesting information. The committee had sent a circular to every street railway company in North America asking how much had been done in this line. From some of the States it was reported that transportation of express and freight by street railways were prohibited by State law, and many of the roads stated that their franchises permitted the transportation of passengers only. It was found, however, that there were 62 street railways now carrying mail, and 58 of these have United States government contracts. The only method for handling a large mail service, when it is necessary to collect and distribute along the route, is to have a separate mail car in charge of a railway clerk. The best example of this is on a road in St. Louis. The mail car makes three trips each day. The conductor and motorman being furnished by the railroad company, while the Postoffice Department supplies the mail clerk. The mail is received from the general postoffice in pouches and delivered to the carriers along the route. A light freight business is also done on the car, provisions, trunks, milk and all sorts of bundles are carried and charges collected by the conductors. The car has been very profitable to the company. It depends wholly upon local conditions whether mail service is wanted on street railways. In regard to express and freight business 35 roads are now engaged in express business, while 35 are handling freight.

An Incident of Signal Practice in India.

The incident shown in the picture herewith, which we reproduce from the London *Graphic*, amusing enough as thus depicted, though far from pleasant at the time to the principal actor, occurred recently in the vicinity of a station in Northern India. Being confronted by a tiger when about to light the signal lamps, the man promptly took refuge up the signal post, and was only released from this unpleasant

A GOOD MEAL IN SIGHT.

and dangerous position when an approaching train drove the animal away. The following letter descriptive of the occurrence from the native station master is amusing and characteristic of native Indian railroad men:

"From the Station Master——to the Traffic Superintendent R. and K. Railway:

"Sir: I beg to bring to your kind notice that no sooner the watchman Dilsaak reached the distant signal than he saw a tiger coming toward him. He says the moment he was greatly alarmed, but fortunately the Almighty assisted him, and caused him to climb up the signal. The tiger was in thorough expectation of getting prey, and did not remove himself for about half an hour. When the train whistled he began to roar, and aroused at the distant signal he ran away. Up to this time Dilsaak was in the signal; he says he was seen by passengers, and the driver in charge, towards whom he loudly cried with a view to make him slow. . . . Under the circumstances you will kindly put a stop of lighting the distant signal, otherwise one day a life of mankind would be victim to the wild animals."

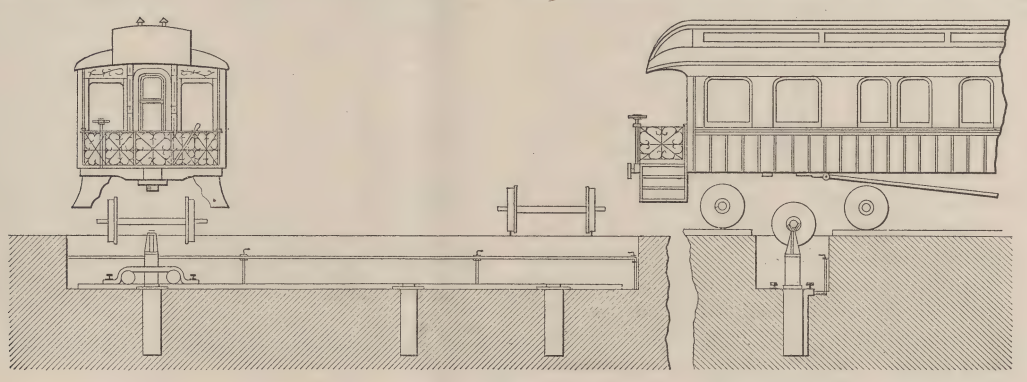
An Encouraging View.

President Ashley of the Wabash Railroad, in commenting recently on the prospects of railroad business in the near future, said:

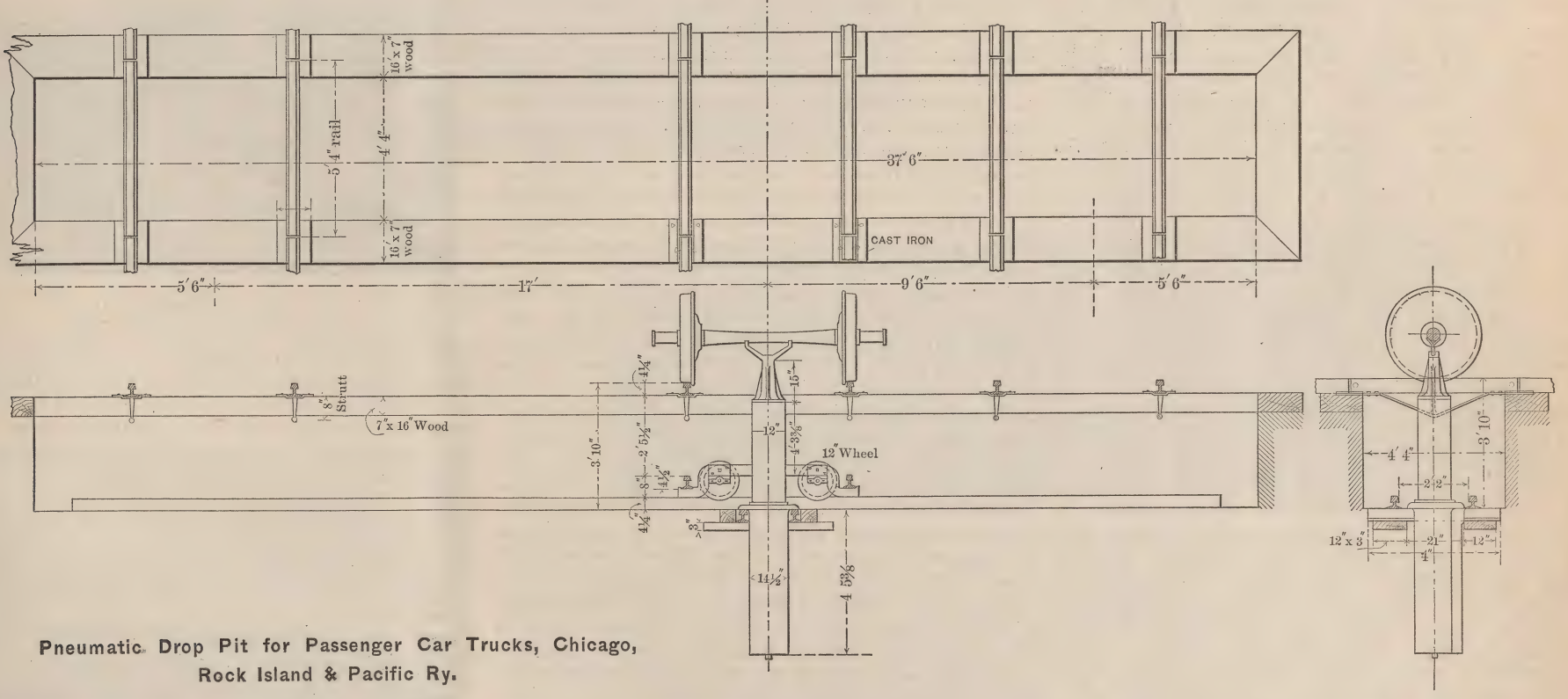
The business of the railroads of the West is gradually increasing. Our freight business is picking up nicely and is ahead of last year. The fourth week in November shows an increase of some $10,000 over the same period last year in freight receipts alone, and the first week in December runs above these figures. And you must bear in mind that the corn crops are not being moved yet, which will still further swell the receipts. A little soft corn is being shipped now, but the bulk of it will be in the winter and spring, when the corn is hard. All along our line from Toledo to Kansas City the corn crop is good, and this means a fair freight traffic. I am very sanguine that the coming year will witness a revival of business in all lines of industry. Unless something unforeseen occurs we shall be well on the way to the heydey of prosperity by this time next year.

Pneumatic Drop Pit for Passenger Car Trucks.

The Chicago, Rock Island & Pacific has in use at its Chicago shops an ingenious arrangement for removing wheels from beneath passenger cars. The arrangement was designed by Mr. George F. Wilson, Superintendent of Motive Power and Equipment of the road, and we are indebted to him for our drawings and information concerning it. All the wheels under the passenger cars of this road are changed at the Chicago shops, except those of a few cars that do not run into Chicago. From 130 to 150 pairs of wheels are replaced at these shops every month, so any important saving in the work would effect considerable economy. This arrangement accomplishes this purpose, saving in labor alone about 55 per cent., besides being in other ways a great improvement over the old way of jacking up a car to remove the wheels.



This drop-pit is located in the passenger yard at Fifty-first street, and is operated by compressed air. It was completed in May, 1893, and has since that time worked perfectly satisfactory. The pit is 37 ft. long and is arranged with 3 tracks across. One of these tracks is used for the storage of wheels and the other two for dropping wheels from under passenger cars. At each of these tracks is a stationary air jack, and when the wheels are dropped from the car they are left on a small truck and are on this moved to the storage track, where they are raised, and a new pair of wheels lowered, which in turn are moved back to the car from which the others were taken out and are raised up.



Pneumatic Drop Pit for Passenger Car Trucks, Chicago, Rock Island & Pacific Ry.

Besides the saving in labor effected by this arrangement there is another thing that should be considered, and which is quite important, viz.: The fact that the car never gets twisted or injured by having one corner raised higher than the other, which often was the case when they were jacked up in the old way.

Blacksmithing Three Hundred Years Ago.

An anchor has been recently dredged up from the wreck of one of the vessels of that famous fleet known as the Spanish Armada, which, setting out to invade Britain in 1588, was annihilated by the superior tactics and fighting power of the English seamen. The anchor, which is thickly incrusted with marine growths, measures 5 feet across the flukes and 10 feet from crown to head, and the weight is estimated as being about ¾ ton. The forging is supposed to have been done at the Spanish naval stronghold at Cadiz.

The New York Railroad Club held its regular monthly meeting on Jan. 17. Mr. W. L. Derr read a short paper on appliances and methods for clearing up railroad wrecks.

Master Car Builders' Association Circular.

Interchange of Cars.

To Members of the Master Car Builders' Association:

In presenting this circular your committee trusts that it will not be considered as undertaking the question in hand in any radical way. There has been a tendency for the past few years in the deliberations at the Master Car Builders' Conventions, and in the actions of these conventions, to put upon carowners, in the rules of interchange, more and more responsibility for defects in freight cars, and it is now the intention of the committee to see whether the matter cannot be put in such shape as will decrease not only the cost of repairs to the railroads of the country, but will also eliminate the serious detentions to cars which occur at all interchange points.

The idea is to have cars pass from one road to another if in safe condition for movement, and that the inspection, in so far as stopping cars at junction points is concerned, shall be made simply for safety. It should be considered that the railroads, when moving foreign cars, are paying to their owners for their use a sum in a general way adequate to cover all natural wear and tear and replacement of equipment destroyed and worn out; so that in a general way the owners of cars are paid for the cost of repairs necessary by foreign mileage of their cars. It is probably time that the selfish view, as acted upon at interchange points, in endeavoring to make the connecting lines stand all expense possible in repairs of cars which may be offered for movement, should be considered as no longer serving the individual interest of railroad companies.

It is desired to have a full expression of your opinion, especially in connection with the questions following, sending same to the chairman, care of L. & N. R. R. Co., Louisville, Ky.; and we trust that you will look upon the matter in as broad a view as possible, considering always that the general interest of the railroads at large must be the interest of individual railroads in nearly all cases:

First. How many men do you employ as car inspectors whose services could probably be dispensed with if the inspection were made for safety only, instead of being made for protection also, as is now necessary under the rules of interchange?

Second. Are you in favor of owners being held responsible for the condition of cars except in case of accident or casualty, no repairs to be made except by owners, unless the car is in unsafe condition to run?

Third. If so, have you any suggestions to offer as to what shall be considered *prima-facie* evidence of unfair usage?

Fourth. If this rule were adopted would you restrict its application to roads owning a certain number of cars per hundred miles operated? If so, what would be your recommendations?

Fifth. If not in favor of an absolute responsibility of owners, are you in favor of increasing the number of parts included in rule No. 8? If so, please enumerate parts; and, if necessary, conditions.

Sixth. If you would recommend a greater number of parts for which owners are responsible than those for which they are not, would you recommend changing the rule to read: "Owners will be responsible for all defects developing under fair usage, except" (giving exceptions you would recommend)?

Seventh. If, in your opinion, these questions do not cover the ground fully, will you please aid the committee by giving your ideas on the subject, regardless of or in addition to the questions?

PULASKI LEEDS, J. W. MARDEN, L. PACKARD, J. N. BARR, E. D. NELSON, SAMUEL IRWIN, J. H. RANKIN, Committee.

Master Mechanics' Association Circular.

Utilization of Railroad Scrap Material.

The committee to report on the Utilization of Railroad Scrap Material and the Best Method of Handling the Same desires information upon the subject from every member of the Association. This may take the form of a general statement covering the treatment of the scrap pile as a whole, or a detailed account of your method of utilizing some part of the material usually found therein, or preferably both. Figures showing the saving in cost or the reverse, resulting from the working over of scrap as compared with the cost of new material with the scrap value of the old material deducted, will be especially desirable.

The following questions are given merely by way of suggestion, and it is not expected or desired that members will confine their replies to answers thereto:

1. What is your method of sorting scrap material?
2. Do you arrange with reference to possible future use or only with reference to kind of material?
3. What classes of scrap can be conveniently used without passing through the foundry, the rolling mill or the forge?
4. What are some of the instances in which the working over of scrap may be expected to show an economy over the cost of new material, and can you give in detail methods found best in your own experience?
5. Can you suggest any way in which economical use may be made of scrap bolts, nuts, links and pins, springs, truss rods, tires and other of the smaller parts of rolling stock which accumulate most rapidly in the scrap pile?
6. What use do you make of scrap axles?

Though this subject has been but little discussed, it is one which has an important bearing upon railroad economy, and is therefore one in which every member has an interest. This, added to the practical knowledge which each member must have with some phase of the subject, should insure such a number of full replies as to enable your committee to submit a complete report.

Answers should be mailed to H. P. Robinson, *Railway Age*, Monadnock Block, Chicago, Ill., at the earlist possible date.

H. J. SMALL, HENRY SCHLACKS, H. MONKHOUSE, GEO. W. SMITH, H. P. ROBINSON, *Committee*

An Enterprising Company.

Encouraging indications of reviving industries can be plainly perceived in many branches of trade, and among other cheering items we learn that the Beckwith-Chandler Varnish Company, 193-189 Emmett street, Newark, N. J., and 621 Broadway, New York City, are enlarging their manufacturing facilities to keep pace with their expanding business. Their specialties are the manufacturing of high-grade railway, coach and architectural varnishes; and the gratifying growth of their trade, even during the past protracted dull business period, argues well for their goods and their future. Their officers are Charles B. Beckwith, President; Barrett L. Chandler, Vice-President and Treasurer, and Belmont Tiffany, Secretary. Mr. Perry Tiffany, a son-in-law of Mr. Theo. A. Havemeyer, is also associated with them. Their Secretary, Mr. Belmont Tiffany, is a cousin of Mr. August Belmont, of August Belmont & Co., the well-known bankers, and was for a number of years in their employ.

Mr. Joseph M. Rogan is now connected with the Carpenter Steel Company of Reading, Pa., and is now in Chicago attending to its interests with railroad companies. The chief product of this company is air-hardening steel, which has a very high reputation, and is justly commended for its superior qualities. Mr. Rogan will be found, the principal part of his time, near Chicago.

The Locomotive Boiler.

BY W. H. WESTON.

The first thing of importance in planning to build a locomotive is the boiler. Imperfection in this means the possible failure of the whole engine for practical work, no matter how good the form of construction or the workmanship of the running gear may be. One reason for the deficient boiler power in engines has been that much more attention was given to the details and size of cylinders, wheels, etc., and the boiler made the thing of last consideration.

If speed was desired, then the driving wheels were taken as the leading feature to be considered. If it was to be a freight engine, then the number of drivers and the weight on them were the leading considerations, together with the size of the cylinders, these points being often very carefully taken into account when an engine was to be built for a given purpose, without much reference to the boiler, it being taken for granted that the boiler was, to a great extent, a fixed and invariable thing, that it must have its firebox between the driving axles and frames, and, consequently, of a certain size and area that could not be changed.

It is hardly proper to say that there was no good reason for this general form of boiler being used in the past years of railroad work, because in the old engines the cylinders were much smaller than at the present time, while the driving-wheel base was about the same as now, and the space between the frames being as wide as at present, there was obtained a grate area in proportion to the capacity of the cylinders very much larger than in the engines that are now built or have been built in recent years. The rapid increase in weight and cylinder power of engines during the past eight or ten years demands a far larger boiler capacity than can be effectively had with the old style of construction. Another reason for the old form of boiler being retained so many years was the general impression the the center of gravity must be kept as low as possible to insure safety. But this notion has been disproved in actual practice, and a little careful attention given the question theoretically will clearly show that within reasonable limits the higher the center of gravity the steadier the engine will run.

Not counting the compound type, the engines of the present do not use their steam with any more expansion than formally; therefore when it comes to increasing the volume or working power of the cylinders to more than double what it was a few years since, it is not reasonable to attempt or to suppose that they can be supplied with their maximum quantity of steam from the old form of boiler with but slight increase in steam generating capacity. Such engines can be used for moderate work, but when it comes to putting them onto such work as their weight, cylinders and running gear are capable of performing, there is a failure in the capacity of the boiler to keep up sufficient steam for the cylinders at the required pressure, and no amount of forcing of the fire that can be done will give the amount of steam that is required for the work. Whether an engine is to be used for freight and hard grades, or is for heavy and fast passenger trains, the principal thing that should be considered first in planning the engine is to secure a boiler that will give the steam needed. The failure to do this has resulted in a great many unsatisfactory engines when they were placed at such work as they were expected to do.

In planning a locomotive boiler for a given amount of work that the engine is to do, the first object to secure is size. A moderate steam space is all that is necessary to have, because even if this space in any boiler was ten times its usual size, it would not form a reservoir of stored power of any practical amount. When the cylinders of an engine are drawing steam from a boiler in which the fire for the time may not be at a high temperature, the steam supplied to the cylinders is not from what is stored in the steam space, but is made by the heat that has previously been stored in the water and which causes it to flash to steam as fast as steam is drawn from the space above the water. Consequently all that is necessary in a boiler is just room enough above the water to allow for the separation of the steam, and prevent the water from reaching the dry pipe and causing wet steam. Proper area of water surface for the disengagement of the steam from the water is of far more value than large volume of steam space. As to the size of the water space in a locomotive, it is probable that 8,000 to 9,000 pounds of water is all that is necessary to be had in a boiler at present. And it may be that a better circulation will be had with this than with a larger volume of water.

The matter of circulation in a locomotive boiler is one of much more importance than has been generally supposed, although it is now coming into general consideration. In all boilers the flow of water should be steady and uniform from the part of lowest temperature to the place of greatest steam generation. The circulation should be unchecked in its course between these two points by any obstruction. A locomotive boiler may give a good circulation when a moderate fire is used; and when subjected to the higher temperature in the firebox that is needed for regular work, the circulation may be far from what it should be. Probably very often the principal volume of the water flows up through the spaces at the sides of the firebox, and leaves a deficient amount circulating up between the tubes at the tube sheet, because this course is not so open, direct and unobstructed as that past the sides of the firebox; the water having a much freer passage along the barrel of the boiler next the plates and into the side spaces at the firebox and up over to the crown sheet. With the fire at a high temperature and the water flowing in this way, the result is that there is a tendency to burning of the tube ends and the tube sheet. Therefore, it is not likely that a thin sheet will prevent burning, as is suggested by some, for if there is not a proper amount of water brought in contact with the surfaces there will be a tendency to overheating, no matter whether the sheet is thick or thin.

The only way that overheating by poor circulation can be avoided in the common locomotive boiler is to use a less intense fire than that necessary in ordinary work, or else by employing mechanical means of inducing a circulation. Whether the latter method would be satisfactory in practical work seems very doubtful.

The best way to secure a good circulation in any boiler is to so proportion it as to have all water spaces so formed, connected and of such size that the water can circulate to each heating surface in proper proportion. If this is followed there will not be any defect in the circulation of a boiler under any ordinary circumstances. With a boiler so made the circulation will be good whether the temperature in the firebox is that of a moderate fire, or whether the conditions are such that the fire is forced continuously.

As to the question of grate area, it cannot be expected that when 100 to 150 pounds of coal is burned per square foot per hour on a grate that there can be economy in the use of fuel. A point of importance in this connection is that, with a larger area of grate surface in a given boiler, so that there will be less forcing of the fire, there will be less tendency to burning of the firebox plates and less deterioration in all ways.

In regard to the amount of heating surface in a boiler, it is not directly a matter of a given ratio with the grate area, but should be figured in direct connection with the amount of coal burned per hour. In common stationary boilers the amount of coal used per hour per square foot of heating surface is about 0.3 pound. And in marine boilers it is about 0.5 to 0.6 pound, while in the ordinary locomotive it runs very much above the latter figures. As about 0.5 pound of coal per square foot of heating surface per hour is the maximum amount that can be burned with fair economy, it is evident that excess above this amount should be kept as small as possible. Of course with the limitations of shape and space that are imposed on locomotive building, it is a very hard matter to secure such dimensions in the various parts as are wished for. But the nearer the area of heating surface can be brought to such an amount as will reduce the excessive quantity of coal burned per foot, the better the economy. Extra amount of heating surface in a locomotive boiler cannot be had by crowding the tubes too close together as some try to do, because the narrower water spaces between them cause foaming and overheating of the metal. The only way to secure an increased area of surface is by making the boilers larger, thereby securing larger spaces and a larger area of sheets; as before mentioned, boilers can be made larger than has been the common practice in the past, without any danger to their stability; and as great weight is required to give adhesion to the drivers for tractive purposes, it is of advantage to have a heavy boiler.

As to the form of boiler that is best adapted to locomotive building generally, it is not probable that any one particular form can be specified as better than all others. Yet there are some styles that must be given up if improvement is to be secured. For instance, the boiler with a small barrel and with the firebox down between the driving axles will not properly answer the requirements of a heavy service, no matter how it is equipped, because it will not make sufficient steam and is not heavy enough. A form of boiler that will obviate the disadvantages of broken and leaky staybolts around the firebox caused by the unequal expansion of the plates through which they pass is of the greatest advantage to secure.

To sum up the points in boiler construction: Secure a large boiler and large grate and heating surfaces, and such water spaces that the circulation will be positive and in proper proportion over the various parts of the heating surface. If possible avoid the introduction of staybolts through plates that are of such shape or occupy such positions relatively to one another as to cause twisting or bending of the staybolts, or a tendency to bulging of the plates or straining of the seams around the firebox by expansion; and don't try to make a boiler that is only fit for 200 or 300 horse power develop steam for 500 horse power.

A Texas judge has declared the anti-scalper law unconstitutional. He says that when a railroad company sells a ticket it presumably gets all it is worth, and that a scalper has the same right that dealers in other second-hand articles have.

Rubber stud-blocks are being experimented with on the steps of the cars used by the Glasgow & Southwestern Railroad, with a view of testing their suitability as a preventive to slipping on entering or leaving the car. These blocks consist of inch-square iron plates, with rubber on one side and nail points on the other. They are readily driven into the wood.

Some Indian Rolling Stock.

The engravings accompanying this article illustrate some different types of rolling stock on the Burma State Railway of India. We are indebted for the photographs from which our engravings were made, and for the information concerning the cars and the locomotive, to the courtesy of Mr. C. E. Cardew, Locomotive and Carriage Superintendent of the railway named. Mr. Cardew wishes us to acknowledge his inbebtedness to Messrs. Watts and Skeen, of Rangoon, for the photographs he sent us, these gentlemen being the artists to whose skill is due the excellent pictures obtained of these cars.

The Burma State Railway is a meter gage road, and of

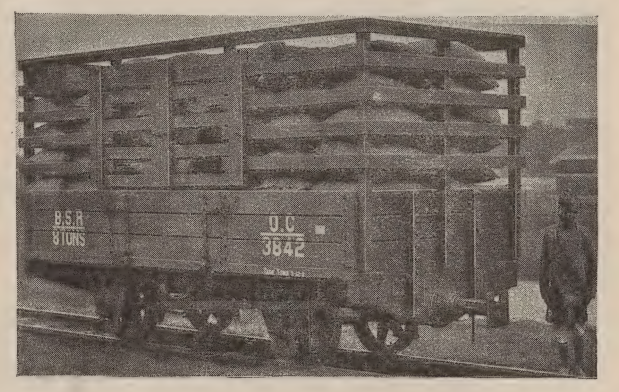


FIG. 1.—OPEN-CRIB FREIGHT CAR.

course the rolling stock is built to this gage. Fig. 1 shows an open-crib freight car mounted on four wheels and capable of carrying eight tons of freight. It has a capacity of 608 cubic feet. It is 15 feet long and 7 feet 2 inches wide, and 9 feet 2½ inches high, measuring from the rail to the top of the crib. These cars, in common with all of the freight cars on this road, have the side lever-brake shown in Fig. 1. This is found to be an efficient brake arrangement for these cars. As will be seen, the gates and drop-door at the side of the car furnish an easy means of loading and unloading. The guard, or brakeman, standing by the end of the car should not be without interest to American trainmen. He is a smart-looking fellow, and could probably give any of us "pointers" on railroading in India. Any American trainman who thinks that he could sup-

FIG. 2.—BOX FREIGHT CAR.

plant this Burmese to advantage would probably find that he had more of a job on hand than he bargained for. Such are the varying conditions of life and work in the different countries of the world. A Burmese trainman on an American road, and an American trainman on a Burmese road would both be about equally out of place.

Fig. 2 shows a standard box freight car. It is 15 feet long, 7 feet wide and 10 feet 1 inch high. Its capacity is 8 tons, or 573 cubic feet. It has similar means of access to the car shown in Fig. 1. All the freight cars are mounted on four wheels. These short cars are found to suit the

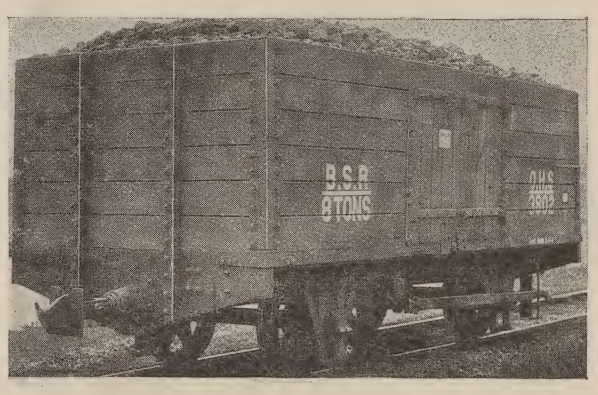


FIG. 3.—HIGH-SIDED FREIGHT CAR.

local traffic conditions better than larger cars. They are all built of Burmese teak or Andamanese padauk.

Fig. 3 shows a high-sided freight car used for various purposes, this one being evidently loaded with coal. It is 15 feet long, 7 feet wide and 7 feet high. Its capacity is 8 tons, or 390 cubic feet. The wheels are of the steel-tired spoke type, 28 inches in diameter.

Fig. 4 shows a Class F freight locomotive, the cylinders are 14 inches by 20 inches, and the 6-coupled driving wheels are 42½ inches in diameter. The engine carries 150 pounds boiler pressure and weighs in working order 19 tons. The tender weighs 13 tons when loaded. It is capable of hauling trains weighing 450 tons at a speed of 15 miles an hour on

a level. Mr. Cardew, in writing to us about Indian locomotives, says:

"The engines are of the usual Indian State Railways types which have been standardized for many years past. The F class (goods) was first designed and built in 1873 by Dûbs & Co., of Glasgow; the O class (passenger) by the same firm in 1881. Since then many hundreds have been built, all alike, by different firms, only differing in a few details as various improvements were suggested from time to time by the locomotive superintendents of various meter-gage Indian State lines."

Fig. 4.—Standard Freight Locomotive, Burma State Railway of India.

Figs. 5 and 6 show full-length and end views of a standard third-class passenger car. This is one of a new and improved type of cars recently put in service on this road. The car is mounted, as seen, on two four-wheel swing-bolster steel trucks, having steel-tired spoke wheels 28 inches in diameter. The underframe is made of steel, the longitudinal members of it being 40 feet long and 2 feet 9 inches high. The car is 11 feet high, measuring from the top of the rail to the top of the roof. The floor width is 7 feet; the sunshade width 8 feet 6 inches; and the inside headway is 7 feet.

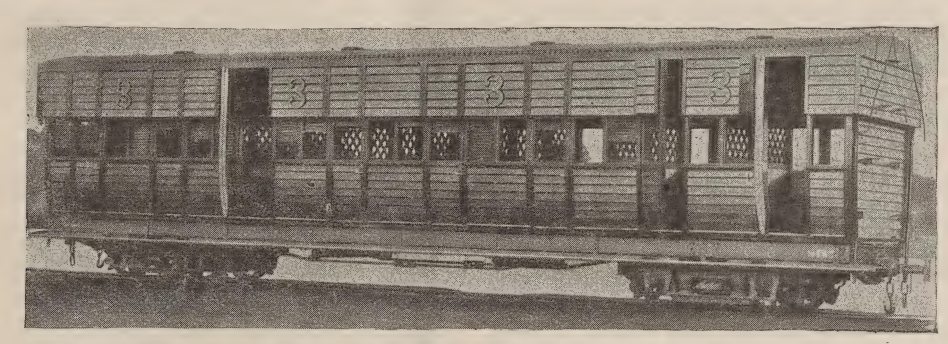


Fig. 5.—Third-Class Passenger Car.

Fig. 7 shows an end view of a second-class passenger car,

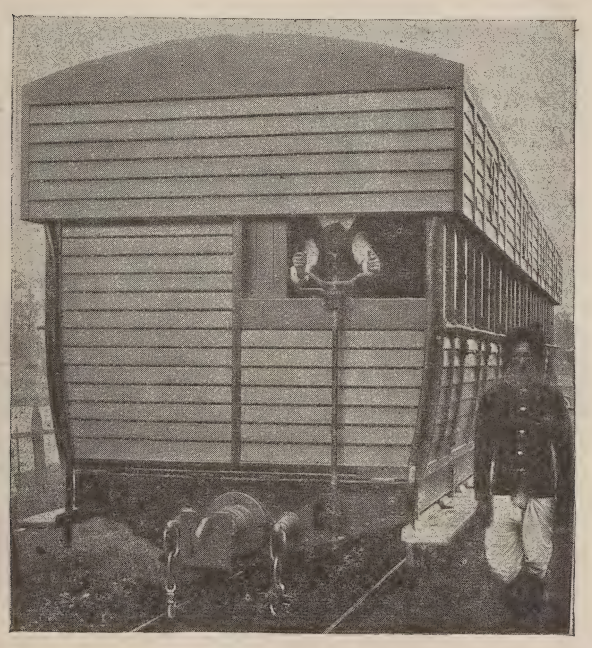


FIG. 6.—END VIEW, THIRD-CLASS CAR.

and Fig. 8 shows a full length view of a first and second class combination compartment car. The second-class compartments are at the two ends, and the first-class are in the middle, away from the vibration of the trucks, the dust raised by the same, and also (by the way) away from the probability of injury in case of collision or telescoping. The dimensions of this car are the same as those of the third-class car, except that the headway or height from floor to ceiling is 8 feet instead of 7.

Fig. 9 shows, on a somewhat larger scale than our other engravings, the ends of two second-class passenger cars coupled together. It shows the coupling arrangement very plainly.

Mr. Cardew writes us in reference to these passenger cars that: "The bodies are built wholly of teak, and I may mention that the top and bottom side rails are all in one piece (without splices) varying from 40 to 44 feet in length. I, of course, get the best of timber in this home of the teak tree. The chief peculiarity of our Indian coaches is, probably, the sunshades, which run right round the vehicle, and in which collapsible hinged pieces are provided over the side doors, opening outward.

"Mr. R. S. Jones' patent flexible buffers and screw couplings are used on these coaches. There are two types in use, one for passenger and one for goods. The elastic flexibility in the latter is provided by the elastic transverse resistance of the buff and draw springs, but in the passenger type the transverse resistance is re-enforced by a special india-rubber ring acted on by a casing in which the buffer plunger slides. It provides great steadiness to short 4-wheeled coaches, but is scarcely needed for long bogie stock. It is a splendid coupling, and we rarely have broken drawbars or coupling hooks. Reading your American papers regularly, I am astonished at the enormous number of failures of couplings you have on American railways."

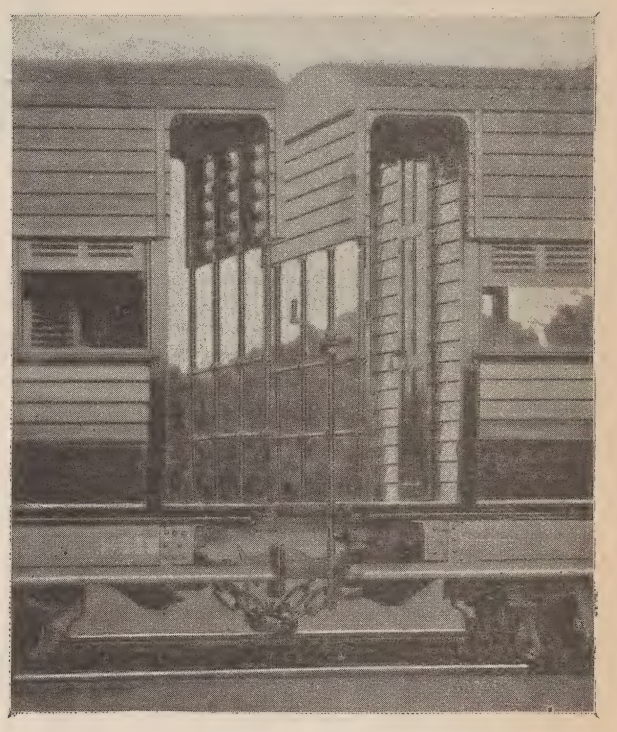


FIG. 9.—COUPLED PASSENGER CARS.

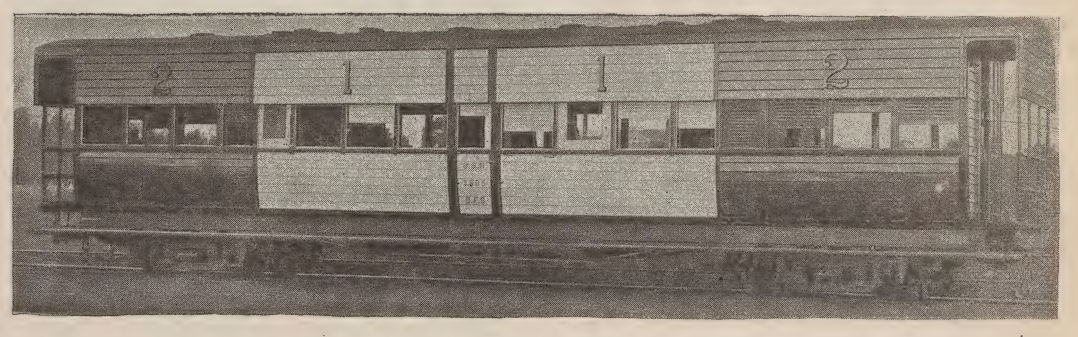


Fig. 8.—First and Second Class Combined Passenger Car.

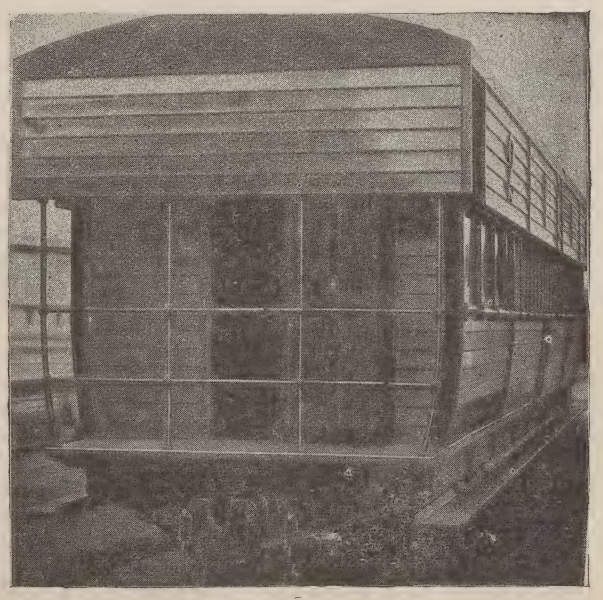


FIG. 7.—END VIEW, SECOND-CLASS CAR.

The ceilings of the first and second class coaches are made of Andamanese thitmin, a remarkably light and handsome, cedar-like wood. These coaches have each two first-class and two second-class compartments. The second-class compartments are at the ends and are entered by end doors from the cross-platforms, provided with stanchions which carry an end sun-shade and serve as a handrail. The first-class are located in the middle. They are entered by end doors from a transverse corridor, which is entered by a door in the center of each side of the coach. The third-class coaches are each divided into eight transverse compartments with side-doors. The compartments are divided only by trellis work walls, and each compartment seats 10 persons. There is one composite second and third-class coach, the third-class portion of which contains a double-sized compartment, fitted with a "latrine," for women only.

The outside colors of the coaches are, first-class white, second-class green, third-class dark yellow, all with chocolate moldings, and iron-work picked out in black. The classes are indicated by large cast-iron figures, 1, 2, 3, about a foot long, fixed on the sun-shade and gilded. These are very prominent, and, with the distinguishing colors, catch the passenger's eye at once.

Mr. Cardew sends us a reprint of an article descriptive of the interior of these cars, published in the Rangoon *Gazette*. We condense it as follows:

The interior of the carriages is severely plain and simple. In fact, there is no decoration at all apart from the inherent design of the wood-work, which is left in its natural beauty with only a coating of French polish or varnish. In the first class compartments are four chair seats, which slide together to make two beds at night, and above them are two upper bunks, which when out of use fold up against the ceiling. These are made of patent steel-ring woven mattress covered with a thin layer of horsehair and trimmed in rep. The cushions on the sliding chairs are made of patent spring seat frames, covered and trimmed the same as the bunks. The cushions are articulated, so that, on the bed parting and sliding back to form two chairs, half the cushion on each tilts up to form the back of the chair. In the second-class compartments both the seats and bunks are made of wire mattress covered with rep cloth. It was intended to have left these bare for second-class, as being amply comfortable, but the cloth covering has been added, as it was found that the steel mattress absorbs heat from the passenger, so that after lying on it for some time it produces a feeling of chill. In the lavatories of both classes are fixed china basins, the first class white and the second-class brown, with a combined water and waste cock. In the first-class compartments there is between each two seats a hinged table, which when not in use folds down into a recess in the side wall of the coach.

All of these cars were built at the shops of the road at Insein, Burma, and were designed by Mr. Cardew. They were built under the superintendence of Mr. H. N. Denby, the Chief Foreman in the carriage and wagon department, with Indian and Chinese workmen.

NATIONAL CAR AND LOCOMOTIVE BUILDER

ESTABLISHED IN 1870.

PUBLISHED MONTHLY

BY

R. M. VAN ARSDALE,

MORSE BUILDING.....NEW YORK.

GEORGE H. BAKER, Editor.

HERBERT W. POOL, Business Manager.

FEBRUARY, 1895.

Subscription.—$2.00 *a year for the United States and Canada; $2.50 a year to Foreign Countries embraced in the Universal Postal Union.*

EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING PAGES. *The reading pages will contain only such matter as we consider of interest to our readers.*

Special Notice.—*As the* NATIONAL CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, correspondence, advertisements, etc., intended for insertion must be received not later than the 25th day of each month.*

Contributions.—*Articles relating to railway rolling stock construction and management and kindred topics, by those who are practically acquainted with these subjects, are specially desired. Also early notices of official changes, and additions of new equipment for the road or the shop by purchase or construction.*

To Subscribers.—*The* NATIONAL CAR AND LOCOMOTIVE BUILDER *is mailed regularly to every subscriber each month. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery, and in case the paper is not then obtained this office should be notified, so that the missing paper may be supplied. When a subscriber* **changes his address** *he ought to notify this office at once, so that the paper may be sent to the proper destination.*

AN ADDITION TO OUR STAFF.

Beginning the first of February Mr. Herbert W. Pool is appointed Business Manager of the NATIONAL CAR AND LOCOMOTIVE BUILDER. Mr. Pool formerly for a number of years was a representative of the *Railway Age*, of Chicago, and for the last several years has represented the *Street Railway Journal*, of New York. During the many years he has been in the railway newspaper business, he has become very widely known among the manufacturers of railway supplies, and he is known but to be respected and esteemed. We bespeak for him the kind consideration of our patrons.

IRON AND STEEL AXLES.

Railroad officers who are responsible for the successful operating and the cost of maintaining cars and locomotives have for many years been divided in opinion as to which material is best for axles, iron or steel. This division of opinion exists very strongly to-day, and on either side are to be found men of the keenest intelligence and ripest experience. On some railroads owning and operating thousands of cars and hundreds of locomotives, iron is used exclusively for axles, and steel is regarded with absolute distrust as a material for this purpose. On other equally large roads steel is used exclusively for axles, and iron is regarded as having ceased to be the best material for this purpose.

The advocates of iron axles claim that iron will last longer, run cooler and break less often and less unexpectedly than steel. The advocates of steel maintain that axles made of it will last longer, run cooler and break less often and unexpectedly than iron axles. These conflicting opinions seem about as hard to reconcile as the old woman's statement to a neighbor late in the month: "Would you belave it, now, if Oi was to tell yez thot Finnegan's goat ate oop a foive dollar bill belongin's to me ould man?" To which the neighbor replied: "Oi would not. If it wor a wan dollar bill Oi wud thry to belave it, though it would be harrud to do this long afther pay day." Happily, there are a number of rolling stock officers who occupy a middle ground in this matter, and who, by patient and unprejudiced investigation, are trying to find out which material is really the best for axles.

Advocates of iron axles claim that steel is not reliable, that it is brittle, and that axles made of it are liable to break without warning and in unexpected ways. They regard iron as being more ductile and tenacious, and as apt to give some warning (by bending or cracking) of its inability to withstand further service. They claim that iron journals are more easily lubricated than steel journals, that they attain a smoother polish, and that consequently there are fewer "hot boxes," and their attendant delays and annoyance.

Controverting these claims, the steel advocates say that axles of this material are more reliable than iron axles, as they are more uniform in strength, and as a short experience with them gives definite information as to the mileage they may safely be depended on giving. They claim that new iron axles are liable to break, but that steel axles, when properly made, may be depended on to run within a few thousand miles of the several hundred thousand miles they are capable of. This enables an increased amount of service to be got out of them, and their final removal and replacement before the safe limit of their usefulness has been reached. As proof of this, it is submitted that some prominent railroads work to this plan with unvarying success. As to hot journals, it is claimed that steel is superior to iron for cool running, because the surface of the journal is smooth and uniform, whereas iron journals are afflicted with seams that tend to heating and that grow worse with use, frequently condemning them to the scrap-pile. Very little is known positively as to the relative wear of iron and steel journals, but it is claimed that the scrap value of steel axles is considerably more than that of iron axles, and that old steel axles are capable of more valuable use than iron ones. As illustrating this last point, it may be enough to say that one large road of our acquaintance that uses steel axles exclusively utilizes all old driving-axles in the manufacture of crank-pins, and works up all old car axles into piston-rods.

The question of iron versus steel axles is one of great importance on any large road, and it is one that must be decided by practical experience. On some roads the verdict has been changed several times in favor of one or the other material. Doubtless this will reoccur on numerous other roads. As the art of steel making grows older and more is learned of the refinements of its manufacture, there is strong probability that previous or existing imperfections for special uses will be overcome by improvement. Our observation is that steel for axles is growing in favor at the expense of iron. If this view is correct, it indicates improvements in steel made for this purpose, and it also indicates that the safe position for rolling stock officers to take is one in which prejudices formed by long ago experiences shall have no place.

THE POWER OF REMOVAL.

The communication on another page from a division master mechanic of a railroad, who lost his position through changes in superior officers, is of interest as being typical of many such statements that could be made, but are not. He says in substance that men in his position have no protection against summary dismissal, while subordinate employes have. The trouble in his case seems to have been (from his point of view) that a new superintendent of motive power who wished to place a favorite, sacrificed our correspondent in order to do so "without any charges" being made of his unfitness or undesirability for the position he held. The statement proves one of two things: either our correspondent was unfit for the position he held, or the superior officer was unfit for his position.

If an employe of the mechanical department of a railroad wins promotion to such an extent that he finally becomes a division master mechanic, he ought in the mean time to have learned enough to hold his own. Exceptionally good work by a division master mechanic will in time become known beyond the limits of the mechanical department, and then if a change in the office of superintendent of motive power is decided on, the exceptionally good master mechanic is apt to be invited to fill the higher office. If through lack of ability or zeal he fails to impress the general officers with the belief that he is the best man they can get for the more responsible position, he has no just grievance if another man is selected. If, for any cause, he impresses the new superintendent of the department with the conviction that he is incompetent for his position, or that the discipline or the efficient conduct of the department cannot be best served by him, there is but one of two things to be done: either he or the new superintendent must retire.

Self-esteem is an excellent quality for any man to possess in a moderate way, but when possessed in an immoderate way it causes no end of self-deception and disappointment. Much self-esteem needs great ability to back it up. Too often, with most of us, our self-estimation is out of proportion with our real ability. Burns said:

> "O wad some pow'r the giftie gie us,
> To see oursels as others see us;
> It wad frae mony a blunder free us,
> And foolish notion."

In the matter of promotion in railroad service it is others who judge of our ability, and rightly so. The selection of a superintendent of motive power devolves upon the heads of the operating department and is a serious matter, involving not only the possible safety and efficiency of the whole road, but also large possible economies or useless expenditures. Beside such considerations as these personal preferences must be, and are, dwarfed to nothingness. The best available man must be had, and if it is not apparent to those who are responsible for the selection that he is present on the road they naturally look elsewhere. All rules have exceptions, but generally speaking the foregoing correctly outlines the practice of intelligent and conscientious managers in selecting a head for the mechanical department. When a man is selected for the office, whether from "home" or "foreign" stock, it is the plain duty of everybody in the department to strengthen his hands in every legitimate way. Opposition to him is opposition to the interests of the railroad company, and the offender is guilty of such lack of loyalty, such poor policy (selfishly considered), and such poor diplomacy that his unworthiness and incapacity are proved; he deserves no consideration, and if he is invited to resign he simply reaps what he has sown. In the majority of cases such conduct does not receive the treatment it deserves. The new superintendent, anxious to avoid friction and desiring to retain men familiar with the local conditions, is generally willing to put up with a good deal at the start, hoping that time and better acquaintance will prove efficient lubricants and win co-operation. We have known this condition of affairs to exist on some of the most prominent railroads when we believe that forbearance was no virtue.

As for the new superintendent, he can hardly commit a greater mistake than to have a lot of "followers," unless on thorough acquaintance with his new surroundings he finds it absolutely necessary to make numerous changes. Every such change should be based on simple justice and fair and open dealing. There should be no dismissals for "cause," unless the cause exists and is plainly stated. Under modern conditions of railroad management the humblest employee has the right of appeal to the highest officer if he has been unjustly treated by his immediate superior. This is but fair. Any man in the service of a railroad is foolish if he suffers an injustice without such appeal. A new superintendent of motive power would suffer deserved loss of prestige with his superiors if in one or more such cases of appeal his judgment was not approved. While the power of removal possessed by the head of a department is absolutely necessary for the discipline and efficiency of the department, it should never be used immoderately or unjustly. If an old employee is found to have attained a position he is incapable of filling satisfactorily, and he is yet capable of filling a subordinate position satisfactorily, he should be permitted to remain in the service of the company if there is no good reason for his not doing so.

REVISION OF INTERCHANGE RULES.

There is going to be an unusually strong and well organized movement to effect, at the next Master Car Builders' convention, what are believed to be needed changes in the code or rules relating to the interchange of cars. Already there is concerted movement among the various railroad clubs to combine their influence in securing revision of such rules as they shall mutually agree upon.

Overshadowing all other proposed or possible changes in these rules, is that which aims to place the responsibility for all defects of freight cars on the car owners, except such defects as result from accident or rough usage. This is the most sweeping change in these rules that has been proposed since their adoption. At the M. C. B. convention in 1892 Mr. J.W. Marden suggested that the mileage charge on freight cars ought to be made to pay for the running repairs and to replace the car when worn out, thus making the owners responsible for running repairs. He received no encouragement toward the adoption of such a plan by the association, although he has since effected similar arrangements of interchange with his immediately connecting roads. At the convention of 1894 Mr. J. N. Barr suggested that car owners be made responsible for drawbars, drawbar timbers, drawbar springs and sills cracked over transoms. The suggestion was favorably received and a motion was put to make owners responsible for "Broken or defective draft timbers or draft springs, or center plates, or sills cracked over transoms, if damage is not caused by derailment or wreck." The vote on the motion was 386 for and 465 against it. We published in our last issue the new plan of car interchange entered into between 12 of the roads entering Chicago. This plan practically embraces nearly all the common defects in cars that result from fair usage, and makes the owners responsible for them. There is little doubt that at the next convention a somewhat similar plan will be adopted in order to simplify inspection of cars at interchange points and facilitate the movement of freight traffic.

THE BROOKLYN STRIKE.

Between six and seven thousand motormen and conductors employed on the electric street cars of Brooklyn struck for an increase of pay Jan. 14. As we go to press the strike is still "on," and the street car service of the city has been in a more or less crippled condition for over two weeks. Early in the strike the New York State Board of Mediation endeavored to settle the dispute between the employes and the companies involved, but while concessions were made by both sides in the interest of peace a fatal stumbling-block was met in the demands of the men that all of the strikers should be reinstated. As several hundred new men had already been employed this

demand was refused and the fight continued, characterized by much violence, some bloodshed, and some destruction of property ; and during the second week it required a military force of about 10,000 men in addition to the police force of the city to maintain order.

Although at present the strike is nominally in force, yet it has been practically lost for a week. Strikers never seem to realize when their cause is lost until it is too late to get more than a small proportion of the places they vacated. They never seem to know that when they have to resort to violence to prevent the progress of their employer's business, they have lost, for violence will be put down invariably. The demand that all of their number shall be reinstated when the successors of many have already been employed never seems to occur to them as unreasonable, and as an almost insurmountable obstacle to their return to work. The demand is unreasonable because it asks the employer to violate his contracts with the men who have come to his assistance. In nearly every instance it is the closing of the gate between the old men and their employment.

The New York, New Haven & Hartford has decided to equip one of its branch lines (the Nantasket Beach line) with electric power for the movement of trains. The intention is to equip and use standard coaches capable of drawing the ordinary passenger equipment as trailers; to provide electric motors for other and heavier trains, and to apply the electrical arrangements in such a way as not to interfere with the use of the road by the ordinary locomotives whenever required. This departure was decided on by the directors of the company Jan. 12, but President Clark announces that the plans for the new equipment are not sufficiently developed to enable more definite information being given than the above. If the proposition is carried out it will excite much interest, as it will be the first step taken by any of the large steam railroads to substitute electric for steam motive power.

The New York Central & Hudson River Railroad has rescinded the privilege granted to members of the clerical profession allowing them to travel for half-fare. This has naturally raised a good deal of fuss among the reverend gentlemen, some going so far as to recommend boycotting the road, and others claimed that the "cloth" was insulted by this action of the Central's management. Much of the ill-feeling resulted from a misunderstanding of this action. President Depew was reported to have said that the half-rate tickets were withdrawn because some ministers had sold their tickets. He denies having made such a statement, and says: "The truth of the matter is some roads have been selling clerical half-rate tickets to people not entitled to the privilege, and in that way they cut regular rates, and it is to stop this that we rescinded the privilege in question."

Literature.

The Report of Proceedings of the second annual meeting of the Traveling Engineers' Association.

This report gives an account of the proceedings of the convention of this association that was held in Denver last September. It can be procured by addressing the secretary of the association, Mr. W. O. Thompson, Elkhart, Ind.

Ventilation of Railroad Cars. By W. G. Creamer, of New York.

This is a pamphlet made convenient to carry in the pocket. It is a revised reprint of the paper read by Mr. Creamer to the New England Railroad Club at Boston some months ago. As is well known, Mr. Creamer has been for many years an industrious student of the subject of passenger-car ventilation. It is a matter for general regret that those who build and design cars do not regard ventilation as of so much importance as Mr. Creamer does. If they did, railroad traveling would be more pleasant and less injurious to health than it ever has been. Mr. Creamer will send his book free to all who are interested in the subject, and this ought to embrace all railroad men.

An Arrangement for Purifying Feed Water.

The Paris, Lyons & Mediterranean Railway has equipped one of its locomotives with the Chapsal system for heating and purifying the feed water. The arrangement consists of a dome-shaped attachment secured to the top of the boiler, and containing a number of shelves. These shelves are heated by steam from the boiler circulating between them. The feed-water is compelled to pass in contact with these before entering the boiler.

The heating of the water results in the precipitation of lime contained therein, it being stated that at least 50 per cent. of it is deposited on the shelves, and as a consequence there is a material reduction in the amount of scale formed in the boiler. The deposit removed is quite heavy, and in running 3,500 miles covers the plates to a thickness of about two inches.

The Treatment of Castings for Air Apparatus.

In reference to the treatment of casting used in airbrake work, a contemporary publishes the following:

It is not generally known that all iron castings used in airbrake work, which are subject to air pressure, such as reservoirs, cylinders, couplings, etc., are subjected to a process of boiling in a special mixture which fills the pores and prevents the loss of air through them in service. The best bath thus far obtained for this purpose is, we understand, a mixture of stearin and a special wax obtained in Brazil. The castings are boiled in this, and when removed the mixture solidifies in the pores, making tight castings which, though sound, could not be employed otherwise.

The process referred to is not as important as this paragraph may lead people to suppose. The process used by the Westinghouse Air Brake Company consists merely in dipping certain castings into melted paraffin for the purpose of filling up the pores in such castings as are difficult to make perfectly solid, owing to their necessarily peculiar construction. This answers very well for castings to be used in connection with air pressure, but, of course, would not be suitable where steam is to be used, as the heat would melt the paraffin.

Axle Breakages on German Railroads.

Eighty-five German railroads report the following axle breakages in 1893 :

The report covers the performance of 1,180,741 axles, 78% of which were steel. On 32 of these roads 151 axles broke. Of these, 31 were locomotive axles and 53 tender axles, so that only 67 were car axles. Of the broken axles, 24 were crucible steel, 27 Martin steel, 21 Bessemer steel, and 3 puddled steel. The average life of the broken crucible steel axles had been 18 years, of the Martin steel 6 years, of the Bessemer steel 16 years, of the puddled steel 24 years, of the iron axles 24 years. The average mileage of the axles previous to the fracture was 254,000 miles for the locomotive axles 215,000 for the tender axles, and 182,600 miles for the car axles. The average distance run since the last inspection was 19,000 miles for locomotion, 16,000 for tender, and 9,000 for car axles. Fifty-five breakages were discovered while running between stations, 72 while passing stations, 15 during inspections, and 9 after collisions or derailments. Fifty were in passenger trains, 4 in mixed trains, 72 in freight, and 2 in work trains. As to the position of the fractures, 68 were in journals, 37 in the wheel seat, 29 close to the wheel seat, 16 in the shaft, and 1 in the crank of a driving axle. About 1 out of every 700 locomotive axles broke, 1 tender axle out of 862, 1 car axle out of 1,700. In 539 out of 794 cases the fracture was in the journal, and in 210 cases in the wheel seat.

Locomotives with Prows.

In our last issue we published a short description and some outline drawings of one of the new locomotives of the Paris, Lyons & Mediterranean Railway, equipped with shields to split the air and facilitate movement through it. We notice in an English exchange the following remarks concerning the object which the new design of engine aims to accomplish :

"It has occurred to everybody who has thought of the resistance which the air offers to bodies passing through it at high velocity as curious, to say the least, that the designers of the locomotive paid practically no attention to this subject, treated it, in fact, as a negligible quantity. Negligible it is not. Every form of resistance increases at an enormous ratio with velocity. In liquids and gases it varies with density as well as speed; but, as a rule, the French engineers are right in asserting that to double the velocity will increase the atmospheric resistance at least six fold. We have only to think what this means with a train running at, say, 50 miles an hour and meeting a wind blowing in the opposite direction of the same velocity. It would involve an enormously increased expenditure of energy in the form of fuel. For ships moving in a vastly denser medium nature has compelled recognition of the hard fact. Man's earliest craft had possibly bluff bows like some of our antiquated liners and merchantmen, but some of the rudest canoe builders saw the advantage of the principle of the inclined plane, and in the latest naval types we see cutwaters sharp as a knife. Of course, Dame Nature modeled her fish on least resistance lines, but she did the same also with her birds. From beak to breast the mechanism is as economical of power as it is beautiful in symmetry. And now the Paris, Lyons and Mediterranean Railway Company are going to imitate the fish and the bird, and they have ordered forty locomotives with snouts. Instead of presenting a large surface square to the resistance of the atmosphere they will make the engine front a metal prow, with iron planes sheltering funnel, dome and firebox. In brief, the train will plough its way through the atmosphere, and, instead of driving a huge column of the resisting medium in front of it, will allow it to glance off as the water does when cleft by the finny tribes or the air when an arrow speeds through it.

A Bad Year for Labor Organizations.

The year 1894, which has just been brought to a close, was the most disastrous period in the history of labor organizations. It marked the defeat of the cokeworkers in the Connellsville, Pa., district in the bloodiest and most stubborn strike ever inaugurated in that troublous region, the defeat of the United Mine Workers in their strike against the operators all over the United States, and the defeat of the American Railway Union. Labor has to its credit but one victory during the last year—the concessions granted to the American Railway Union by President J. M. Hill, of the Great Northern road, the newest of the transcontinental systems. The hard times have had more to do with the signal decline of labor organizations than a union of capitalists could have possibly accomplished, and several of the heretofore strongest orders in the labor field have drifted close upon total dismemberment. This is notably true in the case of the Knights of Labor, which under Martin Irons and T. V. Powderly flourished as the strongest labor union on the Western Hemisphere. So rapid has been its decline, and its falling off in membership has been so great, that its officers claim that it can no longer afford workingmen protection against reductions of wages or the encroachments of capital. Grand Master Workman J. R. Sovereign, by way of evasion of the question as to whether the order has not abandoned the policy it was organized to carry out, stated recently that the order is now going forward on political lines. He said that his plan is to get control of the Federal courts and the various lawmaking bodies through the medium of the ballot, and thus redress the wrongs of the laboring men.

The Locomotive and the Fly.

The tsetse fly, so fatal to draft animals throughout large districts of Southern Africa, has at last met a signal defeat. A railroad is now in operation all the way across the fly belt that intervenes between the Indian Ocean and Mashonaland. This railroad extends from the sea 120 miles inland, and at its present terminus ox-wagon trains await in safety the coming of the freight that they distribute among the busy settlements of the new goldfields.

We are glad that the pioneer settlers may now snap their fingers at the dreaded tsetse. When the Mashonaland boom began, some Englishmen thought they would make their fortune by carrying gold seekers from the coast to the new El Dorado. They sent a lot of horses and a half dozen fine new stage coaches to Beira, on the sea, and advertised in the English newspapers that they were ready for business. A party of gold diggers went down the Portuguese coast to take the new short cut to the gold country. Great was their dismay when they learned at Beira that every horse had perished in the fly belt and the stages were stranded there. These vehicles, now mildewed and moldering, are still seen on the road where they were abandoned, a melancholy illustration of the fact that discretion and knowledge must go hand in hand with enterprise to make it pay.

The iron horse gets through. In its triumphant progress it pays no attention to the swarms of the extraordinary insect that never yet saw the pack or wagon train it could not destroy.—*The Sun.*

Annual Report of the Philadelphia & Reading.

The Philadelphia & Reading Railroad Company issued its annual report, Jan. 11, for the year ending Nov. 30, 1894. The operations of the railroad company and the coal and iron company show deficits, and the net earnings, compared with the previous year, show a falling off of over $500,000 for each company. The gross earnings of the railroad company from traffic were $9,065,785 ; rentals, interest, taxes, equipment, payments, etc., amount to $10,478,823, leaving a deficit of $907,405. The gross earnings of the coal and iron company were $268,553, leaving, after interest charges were computed, a deficit of $1,025,601, making a total deficit for the two companies of $1,933,007. The earnings have fallen short by $148,399 of an amount sufficient to pay the charges ahead of the general mortgage interest.

Compared with the previous year the largest falling off was in receipts from coal traffic, $1,543,552. This is owing in part to the strike of the miners in the bituminous coal region and the steady decrease in the freight rate on both classes of coal. The passenger traffic decreased $211,172, and merchandise receipts decreased $729,678.

A Good Beginning.

In recently assuming the office of Vice-President of the Seaboard Air Line, Mr. E. St. John expressed himself in part as follows in a letter addressed : "To all interested."

The property intrusted to our care is a very valuable one; requiring at our hands the greatest consideration. Our efforts must be to increase in every legitimate manner possible its business; while care in the protection of its revenues by the practice of economies, not injurious to its necessities, is enjoined upon all. Let the question be, how much (not how little) can we personally do to aid in the accomplishment of desired results? Efficiency will be required and loyalty to superiors expected. These two go hand in hand and, when united in a common cause, will always prove invincible. To a greater degree, if possible, than ever before, let us strive to possess both.

The undersigned will gladly receive suggestions from every source, when it is believed that such suggestions are in any way likely to improve the business or the service of the Seaboard Air Line, and his doors will be open at all times to officers, department chiefs, employees, or the public at large, who may have business to transact with him, and such persons may be assured of a most cordial welcome.

E. ST. JOHN, Vice-President.

An officer who, on taking control of the operating department of a large railroad, expresses such cordiality of feeling and invites general co-operation, and "suggestions from every source," simply multiplies his strength many times, which must eventually result in greatly increased benefit to the interests of his company.

Personal.

Mr. J. M. Barr has been appointed General Superintendent of the Great Northern.

Mr. E. B. Gibbs, Master Mechanic of the Oregon Railway & Navigation Company, has resigned that position.

Mr. George W. Cushing has resigned his office of Master Mechanic of the Cincinnati, New Orleans & Texas Pacific.

Mr. George L. Bradbury, General Manager of the Lake Erie & Western, has been elected Vice-President of that road.

Mr. J. M. Savin has been appointed General Manager of the Quincy, Omaha & Kansas City R. R., succeeding Mr. Amos Green, resigned.

Mr. H. F. Ball has been appointed General Car Inspector of the Lake Shore & Michigan Southern, vice Mr. F. H. Soule who has resigned.

Mr. Anthony Barrett, General Manager of the Brooklyn Union Elevated R. R., has resigned, and is succeeded by Mr. George W. Wingate.

Mr. Chester W. Bliss has been appointed Assistant General Superintendent of the Boston & Albany, with office at Springfield, Mass.

Mr. F. E. Voight, who has been Master Mechanic of the Cincinnati, Lebanon & Northern, with headquarters at Cincinnati, O., for ten years, has resigned.

Mr. S. K. Dickerson, of the Roanoke Machine Works, has been appointed Master Mechanic of the Norfolk & Western, with headquarters at East Radford, Va.

Mr. C. M. Bissell has been elected Vice-President and General Manager of the Findlay, Fort Wayne & Western Railroad, vice Mr. C. G. Patterson, resigned.

Mr. E. A. Nixon, Traffic Manager of the Memphis Car and Foundry Company, has been elected Vice-President of that company and will consolidate the duties of the two offices.

Mr. J. P. McCuen, Master Mechanic of the Alabama Great Southern, at Birmingham, Ala., has been appointed Master Mechanic of the Cincinnati, New Orleans & Texas Pacific.

Mr. C. C. Leech has been appointed General Foreman of the Western New York & Pennsylvania shops at Buffalo, N. Y. He was formerly Foreman of the Pittsburgh & Western shops at Foxburg, Pa.

Mr. F. Slater, for many years General Foreman of the Milwaukee, Lake Shore & Western shops at Kaukauna, Wis., has been appointed General Foreman of the Chicago shops of the Chicago & Northwestern.

Mr. Richard Gentry having resigned the position of General Manager of the Kansas City, Pittsburgh & Gulf, Mr. E. L. Martin will assume the duties of General Manager in addition to the duties of President.

Mr. W. B. Coffin, General Superintendent of the Jacksonville, Tampa & Key West Railway, in addition to his other duties has been appointed Purchasing Agent of the company in place of Mr. J. H. Bland, resigned.

It is announced that Mr. George H. Prescott, Superintendent of Motive Power on the Vandalia line, will soon retire from that position on account of advanced years and failing health, and that the office will be abolished.

Mr. Edward Canfield has been appointed General Superintendent of the New York, Ontario & Western, vice James P. Bradfield, who has been appointed Superintendent of the Western Division of the New York Central.

Mr. C. Skinner, who has been General Foreman of the Cincinnati, New Orleans & Texas Pacific shops at Ludlow, Ky., has been appointed Master Mechanic of the Alabama Great Southern, with headquarters at Birmingham, Ala.

Mr. J. F. Graham has been appointed Master Mechanic of the Oregon Railway & Navigation Company, with headquarters at Portland, Ore., to succeed Mr. E. B. Gibbs, resigned. Mr. Graham has heretofore been Division Foreman at Le Grande, Ore.

Mr. S. R. Callaway has been elected President of the New York, Chicago & St. Louis Railroad Company. The election of Mr. D. W. Caldwell as President of the Lake Shore & Michigan Southern made necessary the election of a new president for the Nickel Plate.

Mr. B. Reiley has resigned as Master Mechanic of the Des Moines Union to accept the position of General Master Mechanic of the Iowa Central, with headquarters at Marshalltown, Iowa. He is succeeded on the Des Moines Union by Mr. W. H. Whitaker.

Mr. S. A. Souther, heretofore General Foreman of the Benwood, W. Va., shops, has been appointed Master Mechanic of the Parkersburg and Wheeling division of the Baltimore & Ohio, with headquarters at Grafton, W. Va., in place of Mr. George C. Smith, who has been transferred to Keyser, W. Va.

Mr. Charles O. Russell, formerly Superintendent of the Boston & Albany, died at Springfield, Mass., Jan. 8. Mr. Russell had suffered from rheumatism for 20 years, and on this account he resigned the Superintendency Dec. 1, 1882, after 37 years' service with the road in various capacities. He was 70 years old.

Mr. W. H. Miller, formerly Master Mechanic of the Columbus, Hocking Valley & Toledo, and later Superintendent of Motive Power of the Chicago & Eastern Illinois, is to be manager of a company which proposes to establish a plant at Columbus, O., for the purchase, sale and repair of railway equipments.

Mr. John D. Campbell has been appointed Superintendent of Motive Power of the Buffalo & Susquehanna with headquarters at Austin, Pa. Mr. Campbell was for several years Assistant Superintendent of Motive Power of the New York Central, and superintended the equipping of the shops at Depew, near Buffalo.

Mr. W. S. Clarkson has been appointed Master Mechanic of the Rocky Mountain division of the Northern Pacific, with headquarters at Missoula, Mont., vice A. Harrity, resigned, and Mr. F. N. Regan has been appointed Master Mechanic of the Dakota and Missoula division, with headquarters at Fargo, N. D., vice J. E. Phelan, resigned.

Mrs. Nancy W. Adams, the wife of Mr. F. D. Adams, Master Car Builder of the Boston & Albany, died Jan. 16, aged 73. It was only last September that this aged couple celebrated their golden wedding. Few railroad men have as large a circle of friends as the venerable Mr. Adams. He has the sympathy of all of these in his bereavement.

Mr. S. D. Chittenden has been appointed General Manager, Mr. J. A. McDuffin Traffic Manager, and Mr. H. P. Simmons Assistant General Manager, respectively, of the Carrabelle, Tallahassee & Georgia Railroad, which includes the Gulf Terminal & Navigation Company and the Scottish Land & Improvement company, with headquarters at Tallahassee, Fla.

Mr. J. E. Phelan, formerly a Division Master Mechanic and a Division Superintendent of the Northern Pacific, has been chosen Secretary of the Board of Railroad Commissioners of North Dakota. He served as a fireman, engineer and traveling engineer on the road named previous to his promotion to being a master mechanic. He was at one time prominent in the engineers' brotherhood, and about eight years ago came near being elected editor of its journal.

Mr. E. E. Davis, formerly Master Mechanic of the Boston & Maine at Boston, has been appointed Assistant Superintendent of Motive Power of the Philadelphia & Reading. For the past two years Mr. Davis has been connected with the Boies Steel Wheel Company as its Superintendent. While in railroad service he was regarded as one of the best shop managers in New England. He is a young man, and will doubtless prove a valuable acquisition to the official staff of the Philadelphia & Reading.

Mr. George H. Burrows, who for the past 22 years has been Superintendent of the Western Division of the New York Central, has resigned and is succeeded by Mr. J. P. Bradfield. Mr. Burrows is over 72 years of age and has had a varied railroad career. He was Superintendent of the New York Central at Buffalo as long ago as 1853, and was afterward General Superintendent of several railroads, among them the old Toledo, Wabash & Western, for a long time. He returned to the New York Central in 1873.

Mr. C. E. Cardew, Locomotive and Carriage Superintendent of the Burma State Railway, of whose rolling stock we have considerable to say in this issue, is one of the most popular and progressive railroad mechanical officers of India. He was brought up as an engineer in Dûbs & Co.'s locomotive works at Glasgow, and under the late William Stroudley, Locomotive and Carriage Superintendent of the London, Brighton & South Coast Railway. He has been over 18 years in the service of the Government of India on its State railways.

Mr. E. M. Herr has been appointed Assistant Superintendent of Motive Power of the Chicago & North Western. There are few men better known by reputation to our readers than Mr. Herr, but a brief sketch of his railroad career may not be out of place in this announcement of his appointment to a position that his experience and abilities abundantly qualify him to fill with credit to himself and profit to the interests he will serve. He is a graduate of the Sheffield Scientific School of Yale, and was afterward a shop apprentice in the Milwaukee shops of the C., M. & St. P., and then served some years in the C., B. & Q. as Assistant Engineer of Tests, Engineer of Tests, Superintendent of Telegraph, and Division Superintendent. He was later Division Master Mechanic of the C., M. & St. P. at Milwaukee, and then became Superintendent of the Grant Locomotive Works at Chicago. Since those works closed Mr. Herr has traveled extensively in Europe, and has been a close student of the methods of railroad operating in the countries he visited.

Painting Hard Pine.*

I regard linseed oil without pigment as the best priming for hard pine, and white lead and linseed oil as the best paint to coat up with. All combinations containing zinc, barytes or very much yellow ocher are liable to scale from hard pine. I read in a magazine that linseed oil and pine tar mixed made a good priming coat for hard pine. To test the question I primed some Georgia pine, put up on a southern exposure, with one part pine tar and three parts commercial boiled oil, and coated up with two coats of white lead mixed with boiled oil. The paint has endured the heat of two summers; the gloss is gone, but there is no sign of cracking, peeling or chalking. No pitch has come through the paint.

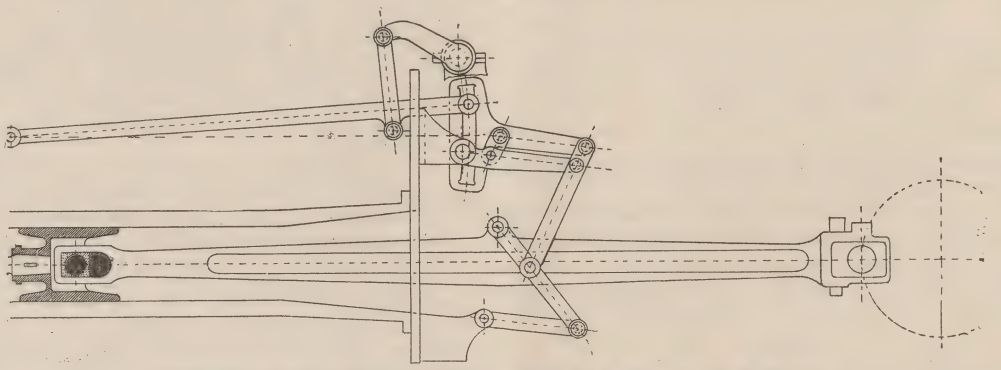
Invention of the Circular Saw.

The circular saw was invented in America in about the year 1770, says a correspondent in *Architceture and Building*, by a combmaker named Hartshorn, who used a common hand-saw to saw out the horn between the teeth, thus forming one of those old-fashioned horn combs. Finally, thinking it rather a slow process, he took what used to be called a "Bungtown copper," filed it down thinner, drilled a hole through its center, then squared the hole and cut the teeth around its outer edge, placed it upon a mandrel true and permanent, then put it into his lathe, and with the flat horn laying upon a wooden rest he sawed out his combs. From the copper he shortly cut up his back-saw and converted it into circular saws.

This man Hartshorn lived and died in Mansfield, Conn. I have been well acquainted with his descendants. He also invented the screw and lip auger, also the bits such as are used in the brace. He was asked why he did not put in his claim for compensation long afterward, when we had a Patent Office. His reply was that if he had done anything that was a benefit to his fellow-men they were welcome to it.

A Norwegian Locomotive Valve Gear.

The accompanying illustration reproduces a drawing sent to us by a Norwegian correspondent, and shows the arrangement of a valve gear for passenger locomotives designed by Mr. O. Adamsen, Master Mechanic and Master Car Builder of the Grand Trunk Railway of Norway. The



Improved Valve Gear, Grand Trunk Railway of Norway.

arrangement has been in service about four years on one of the engines, and it has given such good satisfaction that it has now been applied to five of the other engines on the same road. The arrangement is said to be very quiet-working and durable. The travel of the link-blocks is reduced to less than $\frac{1}{4}$ inch when the engine is working with a normal cut-off.

Fuel Value of Coal, Oil and Gas.

Experiments made by the National Transit Company, and reported in the *American Manufacturer*, show the following to be the comparative fuel value of coal, oil and gas, with boilers of proper construction and proportioned to the work: 1 pound of coal will evaporate 10 pounds of water at 212 degrees Fahrenheit and at atmospheric pressure; 1 pound of oil will evaporate 16 pounds, and 1 pound of natural gas will evaporate 20 pounds of water under the same conditions; 1 pound of coal will equal 11,225 cubic feet natural gas; 2,000 pounds (1 ton) will equal 22,450 cubic feet natural gas; 1 pound of oil will equal 18 cubic feet natural gas; 1 barrel of oil (42 gallons) will equal 5,310 cubic feet natural gas; 1,125 cubic feet natural gas will evaporate 1 pound of water; 1 cubic foot of natural gas will generate 860 heat units; 1,000 cubic feet natural gas will generate 860,000 heat units; 1 ton of coal will generate 19,307,000 heat units; 1 barrel of oil will generate 4,566,600 heat units. In ordinary practice, about twice as much fuel is required to do this amount of evaporation.

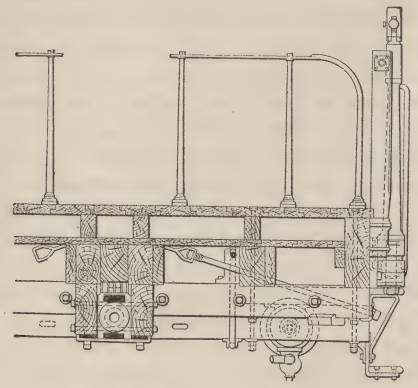
* V. B. Grinnell, in the *Painters' Magazine*.

A Poling Car, N. Y., L. E. & W. R. R.

The process of "staking" or "poling" cars in switching has proved so successful in yards adapted to that method of work that refinements of detail have been adopted from time to time as experience suggested their uses. Railroad men are all familiar with the old "stake" carried on the back of the tender, ironbound and cumbersome, that had to be unloaded when a car was to be "staked" or "poled" to place, and then reloaded at the expense of considerable exertion and the usual accompaniment of profanity. Some genius discovered that all this was unnecessary, and that the pole could be carried just as well on the side of the tender frame within easy reach of a man standing on the ground. Brackets were placed on the side sill of the tender for the pole. This was a great help and saved time and labor.

For many years the end corners of freight cars and tender frames suffered considerable damage from the proddings of poles, for poling a car was always a rather "ticklish" job. Everything had to be just right, or there was failure in the effort, and sometimes trouble and danger. The pole had to be strong, the movement of the engine careful, and the nerve and judgment of the switchman good. The now familiar corner castings, with a depression for the pole end, were the result. Then, for use in yards where there was much poling to be done, engines were equipped with attached poles that could be easily swung into place at the front or back by an attendant.

The latest development in the practice of poling is illustrated by the engravings on this page, which show the construcion of one of three poling cars recently built by the New York, Lake Erie & Western for use in its yards at Jersey City and Newburgh, where much of the work of switching is done by this method. The idea of building special cars for this purpose is to enable the use of any locomotive for this kind of work, as it is sometimes difficult to provide a specially equipped engine.



PART OF CROSS-SECTION.

The design of the car is so well shown by the illustration that a lengthy description is unnecessary. It is 24 feet long, and, to give it stability, is loaded with six tons of old iron placed between the floors. The poles, of which there is one on each side, as shown, are pivoted at the middle of the car, the castings by which they are held being similar to the coupler casting used on the rear of tenders. The pole is a wrought iron tube 10 feet long, and has in it a wooden pole about one foot shorter. In the outer end is a rubber cushion with a wooden nose or point, which can be renewed as frequently as may be necessary. Extra points are carried on the car. The car also carries an outfit of tools needed in yardwork. The lever for swinging the pole around, which is clearly shown in the engraving, is counterweighted, making its operation easy. Four seats are provided for the attendant, as each pole can readily be swung around to push in either direction. On each side of the car a lamp is fixed in a post where it will best aid the man in charge.

As a Grand Trunk train was passing New Haven, Mich., Jan. 26, a man in passing from the smoker to the first-class car lost his balance and fell from the platform while the train was at full speed. He struck a semaphore wire post, the blow breaking his neck and killing him instantly.

Oil for Locomotive Fuel on the Long Island Railroad.

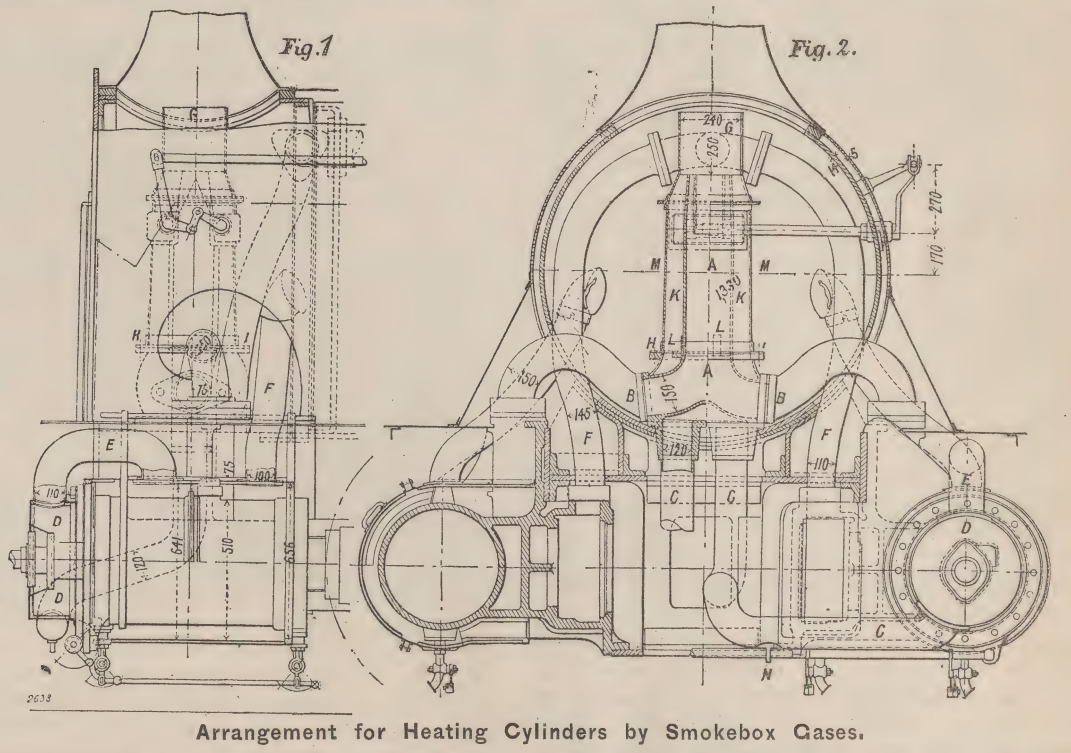
The Standard Oil Co. is conducting some experiments with crude petroleum as a fuel for locomotives on the Long Island Railroad. The quality of the oil is described as "pure oil, with the lighter product taken off, weighing seven pounds per gallon." The burner in use is known as the "Reid," patented by a Mr. Reid, of Oil City, Pa. The Standard company has made several changes in regard to the method of bricking up the firebox, and is still experimenting in that direction. Thus far the efforts have not succeeded in getting the engine to steam as satisfactorily as desired, and consequently no comparative statement can be obtained at present as to the oil burned in competition with coal.

A Method of Utilizing Hot Smokebox Gases.

As is well known, the gases of combustion that reach locomotive smokeboxes average between 800 and 1,000 degrees Fahrenheit. Of course this represents a large amount of wasted heat, as all the heat contained in the gases in excess of that held at 400 degrees (the temperature of the boiler contents under usual working conditions) is not used for any purpose. Mr. L. T. de Kossuth, engineer-in-chief on the Italian State Railways, has recently introduced a system of maintaining around the exterior of locomotive cylinders a circulation of these waste gases on their way to the exhaust, and has obtained some interesting results from this method of utilizing the heat which would otherwise be lost.

We are indebted to *Engineering* for the above illustrations, which show the arrangement as it has been applied to a number of six-wheeled coupled engines on the Mediterranean section of the Italian State Railways. These engines have outside cylinders, with the valve gear placed between the frames. In the smokebox is placed an ejector, *A*, that receive steam at *B*. At its base is a chamber to which there are bolted two pipes, *C*, *C*, that lead to the casings, *D*, which surround the front covers of the cylinders. These casings communicate with those around the cylinders by the pipes, *E*. There is a free connection between the cylinder casings and the smokebox through the pipes, *F*, *F*. The exhaust steam discharged from the upper part of the exhaust pipe, *G*, causes a circulation of a portion of the hot gases in the smokebox through the pipes *F*, the casings of the cylinders and the pipe *C* into the exhaust. The pipes, *F*, *F*, that take the heated gases from the smokebox are enlarged at the mouth, as shown, and are turned toward the tube plate. They are arranged to be easily removed if required. The casings of the cylinders are made in three thicknesses, of two iron plates with a sheet of asbestos paper interposed, the whole being riveted together. As a considerable quantity of cinders and dust is drawn into these casings by the induced draft, they are made into two parts, one of which is fixed and the other is easily removed by detaching a few bolts. This arrangement is necessary, and the casings have to be cleared after every few days' service.

It will be noticed that diaphrams are inserted in the casings (see Fig. 1). The use of these is to determine the circulation of the gases, so that every part of the cylinder may be heated. The casings over the front ends of the cylinders are similar to those just referred to, except that they have no movable parts, there being no accumulation of cinders in them. The ejector is made in two parts, bolted together on the line *HI*. The lower part is of cast iron, and is riveted to the smoke-box; as will be seen, it is provided with junctions for attaching the pipes for the steam and the hot gases; the form of this, of course, varies with different types of locomotives. The exhaust is at *K*; it is of cast iron, and is secured in position by means of three small studs, for facilitating accurate adjustment. This apparatus has been applied on a considerable number of engines in Italy, as well as on locomotives on French and Hungarian railways. A large number of trials have been made, with a view of ascertaining if the arrangement offered any advantage in economy of working.



Arrangement for Heating Cylinders by Smokebox Gases.

While testing an 18-inch by 26-inch cylinder engine equipped with this device and carrying 135 pounds steam pressure, the following results were obtained: The maximum steam pressure at commencement of stroke was 118 pounds per square inch, when the cylinders were heated by the waste gases, and 116 pounds per square inch without reheating. The mean pressure during the stroke was 62.93 pounds in the former case, and 56.5 pounds in the latter. These results indicate an economy of 6.43 pounds per square inch in favor of Mr. Kossuth's arrangement. In another series of trials on the same engine and with a cut-off of 20 per cent., the economy recorded was shown by an increased steam pressure equal to 7.8 pound per square inch during the stroke. The result of several months' regular service with an engine fitted with the reheating apparatus established an economy in fuel of 11 per cent. as compared with the work done by the engine without the heating device, and with other locomotives of the same type doing similar work.

Capital has been subscribed to begin at an early date the construction of a new railroad 100 miles long in Alabama, to be called the Guntersville, Pacific & Blountsville Railway. The road will run from Guntersville, in extreme north Alabama, to Blountsville, 20 miles north of Birmingham, a distance of 100 miles. It will traverse a section rich in ore and coal.

A freight train on the Fall Brook Railway was wrecked near Middlebury, Pa., Jan. 5, by a broken rail. The engine was ditched and eleven cars were wrecked. The engineer was fatally injured by burns and exposure to cold.

Communications.

Care and Maintenance of Airbrakes.

Editor National Car and Locomotive Builder:

As the question of cleaning and caring for airbrakes was being agitated through the various railway clubs and papers for the last two or three years, and wishing to keep up with the procession, I kept urging the importance of this work on our carmen in season and out of season and some time ago posted a set of 12 rules for the guidance of car inspectors and repairers in this matter. Rule No. 3 read as follows:

"Car inspectors must keep a lookout for the stenciling on cylinders of all 'X, Y & Z Route' cars, and when this stenciling does not show the parts to have been oiled, cleaned, etc., within the time fixed by the M. C. B. Code, the car, if empty, should be marked 'Bad Order' and sent to the repair track to receive necessary attention. In carrying out this rule, proper consideration must be given as to whether the repair track force is able to do the work, also as to whether the car can be spared from service or not."

In order to find out just what was being done I placed in the hands of the foreman on Sept. 1, 1894, a blank form on which to report all cars sent to the track under this rule, these blanks being prepared to show, among other things, the last time cleaned as per stenciling on the cylinder, and also the condition of triples and cylinders when the car reached the repair track, under three headings as follows: "Fair," "Bad," "Very bad," it being understood that "Fair" included all the cars on which the brakes were in average service condition. "Bad" included those on which the brakes operated, but the action was so sluggish that if placed in trains with those in good condition they would be liable to produce "rough handling."

"Very bad" was intended to cover all those cars on which the brakes did not work at all, or worked so badly as to be unfit to run.

The repair track was piped for testing air-brakes, and the following list is prepared from these reports, which shows the 150 cars that reached the repair track under this rule during the last four months of 1894 seem worth a passing notice.

REPORT OF TRIPLES AND CYLINDERS CLEANED, OILED, ETC., ON "X Y Z R. R." FOR LAST FOUR MONTHS OF 1894.

Date of last cleaning.	Condition of parts when cars were sent to the repair track.			Total number.
	Fair.	Bad.	Very bad.	
No date, not stenciled...	6	7	24	37
1890 First six months...	..	..	3	3
1890 Second six months.	..	..	1	1
1891 First six months...	..	..	1	1
1891 Second six months.	..	..	13	13
1892 First six months...	1	4	9	14
1892 Second six months.	4	13	13	30
1893 First six months...	9	12	3	24
1893 Second six months.	19	8	.	27
Total	39	44	67	—
Grand total				150

Nothwithstanding the fact that since 1891 the M. C. B. Code has required that this work be done at least once in each 12 months, it will be seen that 37 out of the 150 cars, or over 24 per cent., seem never to have received such attention. It should probably be noted that these were not cars built so recently as to not need it. It will also be noted that only 27 cars, or 18 per cent., had been cleaned since the first half of 1893, or within the one-year limit fixed by the M. C. B. Association, and that 69 cars, or 46 per cent., have run over two years, and many of this number three or four years; all of which might by interpreted as meaning that this matter is looked upon by railway officers as of but little importance. While I do not believe such an interpretation to be correct, yet a study of the list as grouped under the different headings and dates will show there is a very close relation between the condition of the brake and the length of time it has run without cleaning.

It will be seen that of the 18 cars that show under 1890 and 1891, all of them, or 100 per cent., are under the heading "Very bad," while of the 51 shown for 1893 only 3, or a little less than 6 per cent., show under this heading, and for 1892 it shows more nearly an equal division between the three columns, but with 22 under "Very bad," 17 under "Bad," and only 5 under "Fair," it seems quite certain that the M. C. B. Association has made the limit of time they should be allowed to run quite long enough.

No doubt the business depression of the last two years, and consequent reduction of forces, have contributed much more to this condition than the indifference of railway officials, but in the face of these figures it is certainly not surprising that a prominent railway officer when being asked about applying new airbrake equipement, said he thought it would be much more profitable to spend the money in keeping up what had already been applied.

D. F. J.

It is said that during December some of the passenger engines on the St. Louis division of the C., C., C. & St. L. made 8,300 miles, and that many of the freight engines made 3,800 miles.

Proper Shape of Smokestacks.

Editor National Car and Locomotive Builder:

There seems to be nothing so little understood as front end arrangements and stacks to secure a good steaming engine, and my attention was specially called to this fact by reading that the Union Pacific Railroad had thrown away all its extension front ends and returned to the diamond stack and short arch, with remarkable savings in coal, etc. This fact in no way shows that the extension front end is inferior to the short smokebox, or that the straight stack is not far superior to the diamond stack.

A stack, when it gives good results, acts like a pump barrel connected to the arch, the exhaust steam forming the plunger. The exhaust steam must fit the stack barrel and fill it its entire length, and when it does the volume of the stack is pumped out of the arch at each exhaust, the resulting partial vacuum is, of course, filled by the rush of air through the grates, fire and flues. With the diamond stack "the rule" was that its barrel should be in diameter equal to that of the cylinders, and, in fact, it mattered little if it was an inch larger or smaller, because the exhaust steam struck the cone and was "upset on itself" or "squashed" out sidewise, filling the stack barrel completely. When the straight stack was substituted, there was no obstruction, and the exhaust too often then, as it does to-day, never came in contact with the stack below 12 or 15 inches from the top, as in Fig. 3, thus giving a "pull on the fire," due to exhausting from the arch a volume equal to one-fourth or one-fifth the volume of the stack, when it should have (and would have, if properly constructed) exhausted the complete stackful from the arch. The engine did not steam, of course.

I have seen on a certain prominent road a foot or fifteen inches added to the stack's length to make the engine steam, simply because the lower part of the stack was not

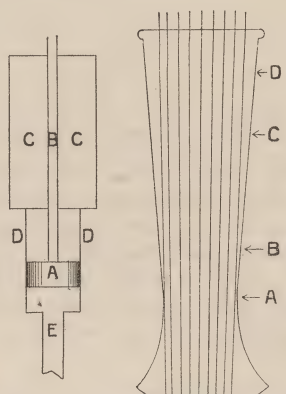


FIG. 1.

FIG. 2.

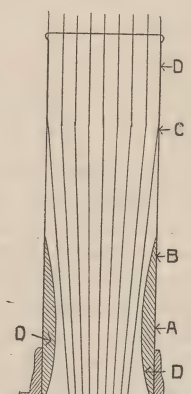


FIG. 3.

used. Fig. 3 shows this clearly. The exhaust does not strike the stack below *c*, hence the volume of the stack above *c* is all that is exhausted during the escape of each exhaust. Below *c* the stack will be found covered with soot, as at *d*, apparently showing that nature is trying to hint that a smaller stack at the bottom is what is needed. I once drilled ⅝ inch holes in a stack at *a*, *b*. *c* and *d*, (Fig. 3), smoke only puffing out at *c* and *d*, while small pieces of paper were held over the holes *a* and *b* and retained in place by the suction.

The action of the stack may be understood if in Fig. 1 *dd* be a pump barrel which enlarges above to *cc* and fitted with a plunger or piston *a* and a pipe *e* connected to the smoke arch. If the barrel of the pump continued thewhole length of the size of *dd*, it is clear that the plunger would fit it the whole length, and "suck" a quantity of air and gases due to the volume of the pump barrel. But, after the plunger passes upward and by the smaller portion *dd*, it would not fit or be in contact with the larger portion *cc*, and the suction would therefore cease as soon as the plunger reached the bottom part of the larger diameter *cc*, thus cutting down the capacity of the pumps over one-half, because there could be no suction unless the plunger *a*, which represents the exhaust steam, fitted the pump barrel (or stack). In this illustration I have exemplified the mistake seen in the straight stacks of a well-known Eastern road known as the "boot leg," which has considerable taper. This road uses this style of stack, which is of but one diameter for all sizes of engines. Fig. 2 shows the trouble here. The exhaust strikes the stack for a short distance *ab* at the bottom, and does not touch it at all at the top. That is, it does not make a vacuum-tight joint, and this fact the writer demonstrated with ⅝-inch holes in such a stack, the smoke puffing out freely at holes *a*, *b*, and not at all or very feebly at *c*, *d*.

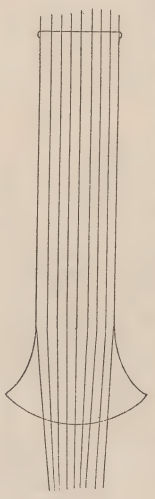


FIG. 4.

The real trouble with the stack question is that it is too often settled in the drafting room, from whence the style shown in Fig. 2 emanated. Rules and proportions are given based on the proportionate area of stack to flue area or cylinder area, or grate area.

The height and diameter of the nozzle have all to do with the diameter of the stack; that is, they have all to do with making the exhaust steam fill the stack at the bottom and continue to fill it to the top. Whatever diameter is right for the bottom of the stack is right for the top, as in Fig. 4. In other words the stack should have no taper, if its functions as an ejector are to be completely utilized for its entire length.

There is but one way to ascertain the diameter the stack should be, and that is to open the front end and *caliper* the stream of exhaust steam at the top of the smoke arch. To do this conveniently the engine should have no fire in its grates and should be coupled to several cars with the lever at full stroke. With the front end door open, the spread of the exhaust may be easily observed and its size obtained. I was once told by a prominent superintendent of motive power that the *larger* the stack the better in order to get rid the more easily of the gases. This kind of theorizing has lost many roads their dividend paying power.

A common fault is a square corner, or one but slightly rounded at the base of the stack, especially when low nozzles are used, when it often occurs that the exhaust strikes the edge and recoils. Ornaments at the top of a straight stack tend to trail the smoke, as the enlargement or inclined top allows the air to cut straight across the top of the stack. It is because of this that diamond stacks are so dirty in this particular. A bluff square top stack causes the air to shoot up, as it necessarily follows the direction of the opposing surface meeting it. This action of the opposing air allows the smoke to be expelled upward a sufficient distance to clear the top of the train.

MASTER MECHANIC.

Locomotive Fuel Consumption.

Editor National Car and Locomotive Builder:

I read with interest Mr. Forsyth's paper on "Locomotive Fuel" in your January number, also the editorial commenting on the same. Mr. Forsyth makes the statement that it takes 18 per cent. more coal to haul a loaded car one mile than it did ten years ago. From the best records I have had access to, I find that, while the nominal carload in that period has fully doubled, the actual average carload hauled has only increased about 20 per cent., or about the same as the coal increase. This accounts partly for the increase in fuel used, but leaves the inference plain that, in the last ten years, little, if any, improvement in the use of fuel has been made upon Mr. Forsyth's road. Taking into account the many improvements in machinery and methods that are supposed to give more economical results, is this showing a creditable one for Mr. Forsyth's road? They may have fallen into what the writer considers a modern error on so many roads in using a very large grate surface with a shallow firebox and relatively small firebox heating surface.

I understand that the 17-inch Class A engine he referred to, as showing very good relative results as compared with other engines of the same size, used the same grate as the other Class A engines, but had a larger boiler and much larger firebox heating surface, which undoubtedly accounted for its better performance. It seems to the writer that there is a large field for study in firebox and boiler proportions for our Western master mechanics.

Z X X.

Domestic vs. Foreign Plush for Car Seats.

Editor National Car and Locomotive Builder:

As one of the chief purposes of the Master Car Builders' Association is to find out what is best to do and what is best to use in car building, why would it not be within its scope to call for international competition between American and European plushmakers to show what plush is intrinsically the best? The different makers could be invited to furnish plush to cover a certain number of seats—all of the same color—and a car with these seats run over some road constantly for a year, giving them the severest general usage. At the convention in 1896 this car would be on inspection, and a jury would pronounce which plush had stood the test the best.

I offer this suggestion for the sake of proving in an emphatic way the superior excellence of American workmanship.

EDWARD P. BLISS,
Pres. Massachusetts Mohair Plush Co.,
Boston, Jan. 24.

The Hazard of Official Position.

Editor National Car and Locomotive Builder:

During some recent official changes on a well-known Southern railroad I was removed from my position as a division master mechanic. I have taken the NATIONAL CAR AND LOCOMOTIVE BUILDER many years and have been much benefited by it. I have read its frequent articles on the proper conduct of employes and the way to win promotion, and I have endeavored to follow on those lines. I served my apprenticeship as machinist, and then studied drawing, and was for years the draftsman and foreman of all new work in the mechanical department. I kept my character clean, and the general manager saw fi

to make me a master mechanic. I held this position for a long time, winning the esteem of superiors and subordinates; then, without any charges against me, I was removed. Now, after fighting for years, as it were, for a place, and then have to lose it without cause and go back and start over again is a great hardship, and life is too short. Is there no way in which high railway officials can be induced to give a person in the position I held at least a fair investigation? An engineer cannot be discharged without just cause and a trial, although but a new employe; but a master mechanic can be removed without investigation or charge, although he has been an employe for 20 years, simply because the new superintendent of motive power has a friend who wants a position as master mechanic.

Ex. M. M.

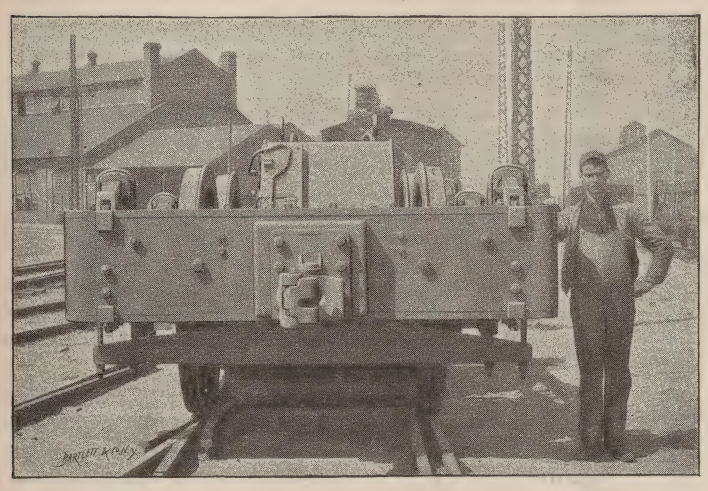
The Cause of Delay.

"I wonder why Maxim's flying machine is so long about getting out?" queried the scientific student.

"As near as I can figure it out," said the disbeliever, "the trouble seems to be a defective flew."

Electric Locomotives for the Baltimore Belt Line Tunnel.

The operations of passenger and freight trains on the Belt Line tunnel of the Baltimore & Ohio Railroad by electric locomotives will soon be realized. Work has been progressing steadily at the works of the General Electric Company, both upon the generating plant and the locomotives, and it is announced that the early part of this year



END VIEW OF ELECTRIC LOCOMOTIVE TRUCK.

will see these locomotives handling the trains in the tunnel. Two comparatively small locomotives, one of 30 tons and the other of 40 tons weight, are already running and proving successful in their operation. The delay that has occurred in the completion of the new engines has been of advantage, as it has allowed the embodiment in their construction of all the recent improvements in electric railway practice.

Our illustrations show side and end views of one of the trucks of a nearly completed locomotive. These trucks are of forged iron, each resting upon four driving wheels of cast steel, 62 inches in diameter. Flexibly supported upon each of these trucks are two six-pole gearless motors, one for each axle, transmitting their motion from the armatures to the wheels by means of a specially designed flexible coupling. The method of spring suspension has been carefully modified to allow of the immediate adjustment of the wheels to the irregularities of the tracks, and thus effect a diminution in the wear both to the motors and the track. The massive armatures are of the iron-clad type. A hollow shaft serves to carry the armature, and through this passes the wheel axle, to which it is connected by the universal coupling just mentioned, which allows free movement in any direction.

The completed motors will be the largest railway motors in the world, and while ponderous in appearance are by no means so bulky as might be expected from the heavy duty they will be called upon to perform. They are so set on the truck that they will be easy of access under all circumstances, whether the locomotive is at a standstill or in motion.

The cab, which will be spring supported on the truck frame, will be of sheet iron and wood and will have windows on all sides, in order that the occupants may have an unobstructed view in all directions. Within the cab will be set up the series parallel controller, by means of which the movements of the locomotive will be at the command of the runner. An air pump, operated by a small electric motor, will supply compressed air for the brakes and the whistle *L*. The locomotive will be also equipped with bells, safety devices, etc., and will have a Janney automatic coupler at each end.

From our illustration of the truck it will be seen that the finished locomotive will be an imposing piece of electrical machinery. It will weigh in its completed state 95 tons, will be 14 feet 3 inches long, 9 feet 6¾ inches wide, and will be of standard gage. The maximum speed for which it is designed is 50 miles an hour. This will be reduced to 30 miles an hour when only half the drawbar pull is exerted and to 15 miles an hour with full drawbar pull. The average speed of the loaded train will be about 30 miles an hour. Of course, the locomotive will run either forward or backward.

These locomotives are designed for heavy work, and will be called upon to handle trains as heavy as those now handled by the heaviest steam passenger locomotives. A test of one of the completed trucks, shown in our engravings, representing half of the locomotive, was recently made on the tracks at the Schenectady works of the construction company. In order to obtain a worthy rival a New York Central heavy six-wheel coupled engine was coupled to the electric truck. The representatives of steam and electric traction were then sent in opposite directions, and tugged vigorously at the connecting coupling. The electric locomotive had some advantage over the steam engine in weight on the driving wheels, and, it is said, pulled it up and down the track with apparent ease. Those who witnessed the test say it was shown that the electric locomotive will, with equal weight on the drivers, start a greater load than the steam locomotive, the pull being constant throughout the entire revolution of the wheel, the difficulty of varation of pull with the angle of the crank as in the steam locomotive being eliminated. The test also proved that the motors were not only sufficiently powerful, but that the driving mechanism and armature couplings were amply strong to transmit the torque of the armature to the axle.

The Central Railway Club.

The annual meeting of the Central Railway Club was held in Buffalo, Jan. 23. President Waitt said that in looking back over the past year he was convinced that some good work had been done which had met with a response and discussion in other clubs and had been approved by the Master Car Builders' Association. He had been asked why there were such long intervals from October to January, and from April to September. He believed that meetings should be held every two months except during the summer, and upon such dates as would not conflict with the sessions of other clubs. The amending of the by-laws by which every other year a representative of the motive power department should be chosen president was undoubtedly a wise action, as in the past the office had invariably been held by some man connected with the car department. An effort had been made during the past two months by selecting subjects for discussion that were of interest to both departments to broaden the scope of the club's work; and the valuable information derived from the various papers read had shown the advantage of this policy.

A resolution was adopted expressing sympathy of the club with Mr. F. D. Adams because of the loss of Mrs. Adams,

Terminal Yards.

The paper on "Terminal Yards," presented last March by Supt. J. B. Morford, of the Michigan Central's Canada division, discussion of which has been repeatedly postponed owing to the absence of superintendents, was again read by its anthor, who stated that the only object he had in view in its preparation was the securing of greater and improved terminals.

Superintendent Watson, of the West Shore, expressed the opinion that unless a terminal yard was sufficiently large to accommodate the business, and its organization sufficiently apt and wide awake to use available advantages, the result was bound to be a blockade of freight and the exhausting of men, with the accompanying danger of wrecks. To this he added that by the use of the poling system on his division they had been able to get along with a less number of switch engines and often found that they had siding room to spare. As a result of his experience he was prepared to indorse the poling system and second the efforts of Mr. Morford to educate the operating forces in terminal yards. On Mr. Watson's division they had reduced breakage 80 per cent. with the poling system, as there was less switching and therefore not so much wear and tear.

Mr. E. D. Bronner, of the Michigan Central, thought it was a logical conclusion that a reduction of switching operations under the poling system would work a corresponding reduction in damage.

Mr. McCarty said that the poling system had been in use in yards of the Pennsylvania Railroad for about 10 years. They were able to get along with from one-third to one-half the number of switch engines required under the old methods, which, if in use to-day, would render it impossible to handle promptly the immense amount of business that is being moved. He was of the opinion that the matter was occupying a good deal of attention abroad, and in France, no matter what may be the size of the yard, they use only the poling system for switching.

Mr. Morford said further that the men did not take kindly to the poling system, because it reduced the number of crews, and the men sometimes conspired to make it unsuccessful.

Car-Door Fastenings.

Mr. J. D. McIlwain, from the Committee on Car-Door Fastenings, made a report supplementary to the one presented at the last meeting, accompanied by drawings. Mr. McIlwain, at the close of his report, said that in his judgment a proper car door, properly hung, that will adequately protect freight in transit, without too great an expense for maintenance, was the most important question now before the car departments.

The annual election of officers resulted as follows:

President, Samuel Higgins, South Bethlehem, Pa., Superintendent of Motive Power, Lehigh Valley; Vice-President, E. D. Bronner, Detroit, Master Car Builder, Michigan Central; Secretary and Treasurer, Harry D. Vought, of the Buffalo *Courier*.

Committees of the Master Blacksmiths' Association

It is announced that committees have been appointed by the Railroad Master Blacksmiths' Association to report at its next convention on the following-named subjects. As each committee has an unusual number of members, we will only give the names of the chairmen, and their addresses:

Axles and Best Methods for Preparing Scrap for, and Manufacturing.—J. G. Hempsted, Woodin Car Manufacturing Company, Berwick, Pa.

Springs.—W. W. McLelland, Denver & Rio Grande, Denver, Col.

Hydraulic Forging, Bull Dozer, Forging, Bending and Cutting Machines, Hammer, Dies, Etc.—Harry Jeffry, Pittsburgh Locomotive Works, Pittsburgh, Pa.

Electric Welding.—A. D. Wilkins, Pittsburgh Locomotive Works, Pittsburgh, Pa.

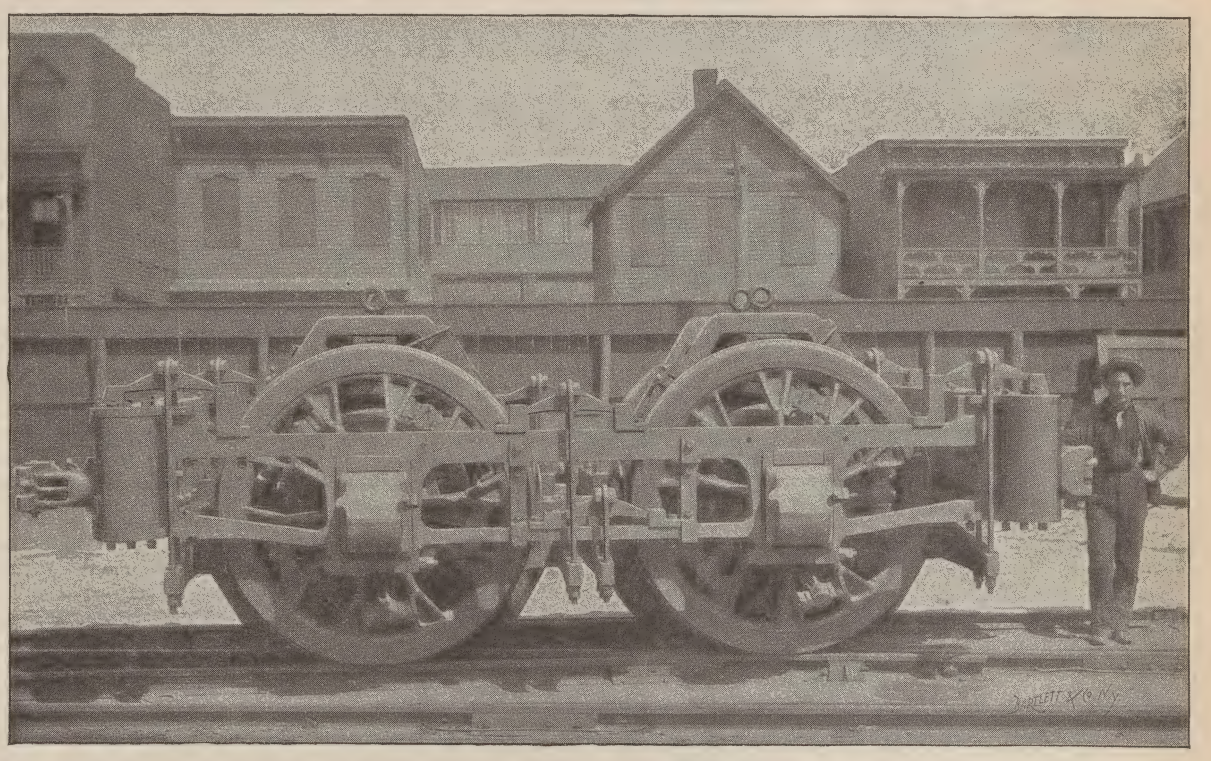
Tool Steel, Tool-making, Tool Dressing, Tempering of Tools, Uses and Treatment of Low and High Carbon Steel, Self-Hardening Steel, Its Advantages, Etc.—G. H. Judy, Pittsburgh, Fort Wayne & Chicago, Fort Wayne, Ind.

Locomotive Frames; Report on Best Method for Making and Repairing of Same.—C. H. Williams, Cincinnati Southern, Ludlow, Ky.

Furnaces and Fuel; to Consider and Report Upon the Best Design for Economy in Fuel, Etc.—A. L. Woodworth, Cincinnati, Hamilton & Dayton, Lima, O.

Proper Material for and Best Methods of Making Side Rods, Crank Pins and Motion Work in General.—John Buckley, Illinois Central, Chicago, Ill.

Welding, Best Methods and Best Results.—William Alexander, Chicago, Milwaukee & St. Paul, Milwaukee, Wis.



A Truck of an Electric Locomotive for the Baltimore Belt Line Tunnel.

The Heirs of the Romans.

Under the slighting light of the yellow sun of October,
Close by the side of the car track, a gang of Dagos were working;
Pausing a moment to catch a note of their liquid Italian,
Faintly I heard an echo of Rome's imperial accents.
Broken-down forms of Latin words from the Senate and Forum,
Now smoothed over by use to the musical lingua Romana.
Then the thought came, Why, these are the heirs of the Romans;
These are the sons of the men who founded the empire of Cæsar;
These are they whose fathers carried the conquering eagles
Over all Gaul and across the sea to Ultima Thule;
The race-type persists unchanged in their eyes and profiles and figures.
Muscular, short, and thick-set, with prominent noses, recalling
"Romanes rerum dominos, gentemque togatam."
See, Labinus is swinging a pick with rhythmical motion;
Yonder one pushing the shovel might be Julius Cæsar,
Lean, deep-eyed, broad-browed, and bald, a man of a thousand;
Further along stands the jolly Horatius Flaccus;
Grim and grave, with rings in his ears, see Cato the censor.
On the side of the track in proud and gloomy seclusion,
Bossing the job, stood a Celt; the race enslaved by the legions,
Sold in the markets of Rome to meet the expenses of Cæsar,
And, as I loitered, the Celt cried out, "Warruk, ye Dagos!"
"Full up your shovel, Paythro, ye hathen! I'll dock yees a quarther."
This he said to the one who resembled the great imperator;
Meekly the dignified Roman kept on patiently digging.
Such are the changes and chances the centuries bring to the nations.
Surely the ups and downs of the world are past calculation,
"Possibly," thus I thought to myself, "the yoke of the Irish
May in turn be lifted from us, in the tenth generation.
Now the Celt is on top, but time may bring his revenges,
Turning the Fenian down, once more to be bossed by a Dago."

Hartford Courant.

Responsibility of Car-Owners for Defects of Freight Cars.*

BY J. W. MAREN.

If a railroad has the reputation of promptly moving freight trains, and thereby promptly delivering freight to its destination, it will not be long before shippers will find it out, and give preference to that road or line. The inspection of cars at receiving points has a great deal to do with the prompt movement of trains. A detention of twenty-four or more hours is frequently made by inspectors, and often when the cars could have gone to destination safely without any repairs, simply because the inspection was made for *protection* instead of *safety*. This we are obliged to do, under our present rules of interchange, for, if a road should receive a car with a cracked draft timber or a cracked sill, and haul it several hundred miles safely to an interchange point, the chances are that the receiving road's inspector would either demand that this defect be repaired or a defect card given for it. If a defect card was applied, some road, and possibly the owner of the car, would make the repairs and bill against the road issuing the card, for the repairs that they were in no way responsible for. There are several reasons why I believe that a change should be made in our rules and that carowners should be made responsible for defects, except as provided for in Rule 9. *First.* In order to inspect for protection, we have got to maintain a larger number of inspectors than we would be obliged to in order to inspect for safety only. In fact, a large proportion of the inspectors' time is now occupied in hunting for minor defects in order to demand a defect card, or have the privilege of setting the car back for repairs. But under our present rules they are justified in doing it; for, if they should allow a defect to pass, and it was found at some other interchange point, they would undoubtedly be censured for not having found it. *Second.* In order to make an inspection for protection, we cause a serious detention to trains for the purpose of such inspection, and, as I have before remarked, any detention of freight trains causes an expense to the company. *Third.* A still further expense, under our present rules, is the switching mileage consequent on the setting back, from receiving to delivering roads, of cars for repairs. *Fourth.* The expense of telegraphing to find out why freight is delayed, and the time of clerical force in traffic department's office in answering letters, questions, etc., from shippers and consignees; in fact, there is hardly any end to the expense on account of the delay of freight.

For several years I have given the subject of inspection careful study; seeking to protect the road in the matter of charges for repairs, which we are not responsible for, and at the same time facilitate the moving of trains and reduce the switching mileage. At the meeting for the revision of the rules, at Saratoga, June, 1892, I advanced the opinion that the mileage charge on freight cars ought to be sufficient to take care of the running repairs and replace the car when worn out, and thus make owners of cars responsible for running repairs. I was met by the reply that we were not quite ready for a movement of that kind. I had, however, made up my mind that something should be done, if possible, between the Fitchburg road and its connections, and I made arrangements with one of our prominent connecting roads to take care of repairs on all cars we delivered to them; we to take care of all repairs they delivered to us, with the exception of those provided for in Rule 9, under the head of Exceptions. A memorandum charge was to be made, and if either road was not satisfied with the results, the arrangement could be canceled in 30 days. It was a success from the beginning, and I now have this arrangement with all of our connections but two; and a plan is now being perfected whereby I think there is no doubt but that all of the roads centering in Boston will adopt this plan. It facilitates the movement of cars, and very materially reduces the switching mileage.

Five or six years ago the New York, Lake Erie & Western, the D. & H. C. Co. and the Fitchburg railroads entered into an arrangement whereby a line inspector was appointed who had charge of all the inspection between Chicago and Boston. We could see no reason why a car that was considered safe to leave Chicago should not run through to Boston without any detention on account of the defects which it had when it left Chicago. Mr. F. H. Soule, now General Inspector for the Lake Shore & Michigan Southern Railroad, was appointed to that position by the three roads named, and it was his business to travel over the line and instruct the inspectors in uniform practice. A car was not allowed to leave any point until it was in condition to pass the inspection at all points, and a car leaving Chicago for Boston with defects came through with the same defects, without being side-tracked.

Both of these plans have been an improvement over our present rules of interchange, and the traffic managers have been more than pleased with the prompt movement of freight trains.

I believe that the detention of cars on account of inspection has become a serious evil, and that the matter should be carefully studied and agitated in all the railroad clubs, and brought before the next annual Convention in so clear a light that there will be no opposition to making car-owners responsible for all defects except those mentioned in Rule 9 under the head of Exceptions; and I am of the opinion that if this plan could be tried for one year, that under no consideration would the managers of our roads allow us to go back to the old plan.

*Address to the New England Railroad Club.

The Boston Belting Company.

The manufacture of rubber was first started in Roxbury (now a part of Boston), by the Roxbury Rubber Company, in 1828. During the year 1842 Mr. John Haskins, the manager of the company, made the acquaintance of Mr. Charles Goodyear, who was then engaged in the manufacture of pocketbooks in Philadelphia, and to him he explained the difficulties under which his company was laboring on account of not being able to preserve the rubber goods for any great length of time after they were made.

Mr. Goodyear was much interested, and soon after made a visit to the factory at Roxbury. Later on he gave up his business at Philadelphia and came to Boston to see if he could discover the long-desired process of curing rubber so that it would not stiffen with cold or soften or decompose with heat. After a long series of experiments, Mr. Goodyear discovered that the use of artificial heat applied to rubber compounds containing sulphur would produce the desired result, and soon after purchased from Mr. Daniel Hayward his patent for the use of sulphur in rubber compounds, and then applied for a patent for the use of sulphur and artificial heat, which was allowed June 15, 1844.

The name of the Roxbury Rubber Company was soon after changed to the Goodyear Manufacturing Company, and so continued until the following year, 1845, when the name was changed to the Boston Belting Company. The manufacture of rubber goods of all kinds was perfected at the factories of the company, and, in 1846, rights to manufacture rubber boots, shoes, clothing, hard rubber goods, etc., were sold, and other companies were then formed for the manufacture of these articles. The Boston Belting Company retained the exclusive right to manufacture all kinds of mechanical rubber goods—hose, packing, springs, valves, tubing. etc. The business of this company steadily increased, the factory buildings have long since covered about three acres of land, and employment is given to more than five hundred men. The capital of the company has been increased from time to time, until it now has a paid-up capital of one million dollars, with a surplus of about six hundred thousand dollars.

The principal store and office is at 256, 258 and 260 Devonshire street, Boston, with a branch store at 100 Chambers street, New York City. Agencies are located in all the great cities in the United States and Europe; also in Australia, Japan and other countries.

Mr. James Bennett Forsyth is the manufacturing agent and general manager. He has been associated with the company from boyhood, and has successfully filled all the leading positions of trust and responsibility connected with the company. Mr. Forsyth has contributed greatly to the success and prosperity of the company, and his inventions and skill as a manufacturer and manager have brought the company fame and profit. His inventions cover many of the most useful machines used in the manufacture of rubber goods, and many of its most useful and profitable articles of manufacture. Medals and diplomas have been awarded to the Boston Belting Company for the highest grade of mechanical rubber goods by the Massachusetts Charitable Mechanics' Association, the American Institute of New York, the Cincinnati and St. Louis Mechanics' Institutes. the New Orleans Exposition and the World's Columbian Exposition. The latter awarded medals and 14 highest awards for the best quality and finish of mechanical rubber goods.

Mr. Henry L. Leach, of 70 Kilby street, Boston, the manufacturer of the well known Leache's sanding apparatus for locomotives, is meeting with encouraging success in the sale of his apparatus, 43 sets of the same being disposed of in December, 41 sets of which were sold. Of these the Boston & Albany purchased four, the Fitchburg, 5; the Fall Brook, 6; the Atlantic Coast Line, 6; and the Norfork & Western, 10.

The McConway & Torley Company, of Pittsburgh, Pa., announces that its eight years' experience in manufacturing Janney couplers for freight cars, and the resulting systematic improvements it has been able to make in the design and material of its couplers, have reduced the cost of maintaining the same from 83.2 to 37.4 cents per car per year. This is certainly an excellent showing, and is in itself very high praise of the intelligent progressiveness that could make such a great improvement.

Messrs. J. W. Hoffman & Co., iron and steel merchants, of Philadelphia, Pa., have sent us a very handsome and serviceable calendar for 1895. It measures 11 inches by 14 inches. The pages are yellow, with large, dark green figures, and the border is black and gold. On the back there are printed a number of very useful tables of the weight of sheet and plate iron per square foot, weight of flat, round and square bar iron per lineal foot, area of circles, and some tables about materials for track construction. The offices of Messrs. Hoffman & Co. are in the Bullitt Building, Philadelphia.

We have received from the Falls Hollow Staybolt Company, of Cuyahoga Falls, O., a handsome calendar for 1895. The hollow staybolt iron made by this company is now too well known to require a description at our hands. It has been well said that staybolts made of this iron are self-inspectors and sure preventives of explosions. They are made from the finest quality charcoal iron, and in all sizes from ⅞ inch to 1½ inch outside diameter, and with any size hole required from ⅛ inch to ¾ inch. They have been specified in nearly all the recent orders for new locomotives, including the 25 engines ordered by the New York, New Haven & Hartford, and the 12 engines ordered by the Chicago & Grand Trunk.

A Handsome Catalogue.

The Nicholson File Company, of Providence, R. I., has issued an elegant catalogue and price list of the many varieties of files and rasps produced by this company. Several thousand varieties of files are illustrated in this book, which is the most handsome work of its kind that has ever reached the office of the NATIONAL CAR AND LOCOMOTIVE BUILDER. The book measures 14¼ inches by 11¼ inches, and is bound in leather with gold lettering. The illustrations are executed in the highest state of the engraver's art, some of the engravings of large rasps being the best production of their kind we have ever seen. Every immaginable variety of files, from coarse horse rasps to fine files for jewelers and watchmakers, is illustrated in this catalogue. The Nicholson File Company has justly earned a world wide reputation for the durability, excellent cutting qualities and great variety of its files. The company was established in 1864, and the output of its works has grown from a few dozen files a day to over 4,000 dozen files a day, and the varieties of these now exceed 3,000.

The calendar for 1895 sent us by the Cleveland Twist Drill Company is one of the most handsome and practically useful calendars that has ever been sent to our office.

The Joseph Dixon Crucible Company, of Jersey City, N. J., has issued a third revised edition for 1895 of its pamphlet on "Graphite as a Lubricant." This little book is both scientific and practical, and certainly contains much information of interest to machinists and engineers.

Two passengers on a Western train became involved in a controversy which waxed so hot that one of them called the other a liar. "What's that, a liar?" and he was on his feet in an instant. "Yes, a liar," was the emphatic response, "or my name ain't John Smith, of Smithville." "What, the hardware merchant?" "The same." "Mr. Smith, I am delighted to meet you. I represent Mr. Sharpedge & Co., of New York, and can show you a line of samples that will make your hair curl."—*Texas Siftings.*

Mr. E. T. Clarage has been appointed manager of the Chichago branch of the Sanderson Bros. Steel Company, of Sheffield, England, and Syracuse, N. Y. It has been said that the ability to produce reliable grades of tool steel is the result of two essentials—the skill which comes from long practice, and the use of proper grades of selected irons. As this company is backed by the accumulated experience of over a century, and enabled through connection with its Sheffield branch to secure at all times a regular supply of the choicest irons known to the world, it is evident that it is abundantly able to make good steel.

Mr. A. B. Burtis has become associated with the firm of The Lowe Bros. Co., of Dayton, O., manufacturers of paints, etc., and will have the entire management of their railroad department. Mr. Burtis is very well known among railroad officials not only as an accomplished salesman, but for his thorough knowledge of the manufacture of paint suited to the requirements of railroad work. He was formerly the manager of the railroad departmnnt of Messrs. Sherwin, Williams & Co., of Cleveland, O., and was with that company for several years. He resigned from that position to become the senior member of the firm of Burtis, Patterson, Sargent & Co., also of Cleveland, O., but retired from that company about a year ago.

The Foster Engineering Company, of Newark, N. J., report a rapidly increasing demand for their new "Class W" steam pressure regulators. Among orders just booked for large valves they mention: One 10-inch for the Lehigh Valley R. R. Company coal mines; three 8-inch and one 5-inch for the Watts Campbell Company, for use at the Newark electric light and power station; and one 6-inch for the U street pumping station, Washington, D. C.; one 5-inch for Dixon's paper mills, and two 6-inch and two 4-inch for the new American liner "St. Louis." These latter are in addition to 20 regulators from 8 inches to 4 inches furnished for that ship in December. This company has just issued a neat little book, entitled "Facts Worth Knowing," that all interested in pressure regulators and pump governors ought to send for.

There is a Spanish proverb that "on Tuesday one should neither travel nor marry," and this superstition is so ingrained that, even in Madrid, there are never any weddings on Tuesdays, and the trains are almost empty.

California dispatches of Jan. 27 announce that the snow lies deeper on the summit of the Sierras than for 20 years, but that there has been an absence of high winds, so that the deep cuts on the Southern Pacific have been easy to clear with the Rotary snowplow.

"An ounce of prevention is worth a pound of cure, ain't it?" said one tramp to another. "Of course it is." "Well, dat's de reason I don't accept no job from nobody. Ef I wus workin' I might be tempted ter go on a strike. An' den see de trouble I'd be in."

The Boston *Transcript* has heard of an economical man. He is a locksmith, and, needing a sign, he went to a sign painter and got an estimate for lettering. Then he nailed two locks to a board and asked the painter to paint after them the word "mith." The Philadelphia *Ledger* suggests, however, that it would have been cheaper to have used only one lock and paid the painter for an "s."

On January 19th, 36 inches of snow fell in western Colorado, blocking railroads and wagon roads. The snow that had previously fallen on the mountains had melted and frozen, making it impossible for the last snowfall to stick, and several bad snowslides resulted. At Lake City an avalanche came down, catching a mail carrier and his team. The driver escaped, losing his team and wagon. At Telluride, a slide near the Keystone mill caught a Rio Grande Southern engine, smashing the cab and seriously bruising the engineer. At Rico the Rio Grande road was blockaded. Another slide at Marshal Basin carried down the Cimarron stables, part of the Cimarron mill, and wrecked a tension station of the Smuggler-Union Tramway.

Notes on English Railway Practice.*

F. A. DELANO.

The most noticeable feature in English locomotive practice is the manner of painting the engines. Only one of the prominent roads in England paints its engines black, but that road (the London & Northwestern) adds so much striping that it gives the engine a very rich and expensive appearance. The colors in use on some of the roads are very georgeous, for example: The Caledonian and the Great Eastern passenger engines are painted a rich blue color all over, with considerable striping and a monogram and coat of the arms of the road on the wheel cover guards; the Midland engines are painted a dark vermilion; the London & Southwestern and the Northeastern engines a brilliant green; the Great Western engines a sort of chocolate color.

Planished iron jackets are not in general use, and although some saving is doubtless made by using a cheaper iron for jackets than Russia or planished iron, still the cost of painting engines must be very high. Several coats of paint are put on and they are rubbed down and varnished with as much care as is ever expended in this country on passenger-car work.

If it were not for the gaudy painting and the absence of the cow-catchers, many of the English engines would not look unlike American locomotives of the same type; for example, the four-wheeled coupled engine with double truck in front, which is in very common use in England, and perhaps the most generally popular engine to-day, is also the most common and probably serviceable engine in America.

In details of construction, however, there are a good many differences in English practice. Many of these are so familiar to you that I need only touch upon them, for example: Inside cylinders are very common, though some railways are using outside cylinder engines almost exclusively because they dislike the crank axle. Plate frames made of rolled iron or steel, usually about 1¼ inches thick; the wrought iron driving wheel conters, for which cast-steel centers are being quite generally substituted, especially in the larger wheels. the copper fireboxes, copper staybolts and copper or brass tubes are all common features of English practice. So far as I know cast-iron driving-wheel centers have not been used in England to any extent. The wrought-iron centers are made by an ingeniously laborious process, and must cost a good deal of money. Their cast-steel centers for large-diameter wheels are, however, fine examples of beautifully light and strong castings.

Steel fireboxes and iron tubes have been tried, but copper fire boxes seem to be very much preferred on most roads, and there seems to be an impression, derived from actual experience or otherwise, that an iron tube cannot be used successfully in a copper firebox, or vice versa. The arguments in favor of copper fireboxes are familiar to you all—that they are easily calked and kept tight, and that the scrap value of the box is much higher, in proportion to the first cost, than in the case of steel fireboxes. The fact that it renuires a greater capital investment is not serious, because money is plentiful on good security at three per cent. in England.

One very noticeable thing in the English practice is the comparatively small variations in the size of fireboxes; about 16 to 20 feet of grate area seems to be standard in all classes of engines, but the firebox is invariably deep. Their engines are pretty generally equipped with brick arches, or water legs, to form a sort of combustion chamber in the firebox. There is usually free admission of air over the fire, chiefly at the furnace door, which opens inward, forming a deflecting plate for the air. On account of the deep fireboxes, the engines are doubtless more easily fired than our engines with very large fireboxes, and I am inclined to think that the small fireboxes enable the engines to be fired with more relative efficiency. Smaller tubes are frequeutly used than in American practice; thus, 1¾ and 1⅞ inch outside diameter is not uncommon, and 1⅝-inch has been successfully tried.

English engines are usually not now constructed with "wagon-top" boilers; the boiler is usually straight and the crown of the firebox secured by crownbars, or radial stays. The throttle valve (generally a slide valve) is usually operated by a screw, and not by a lever, and screw reversing gear is almost universal in passenger service, and pretty common in freight service.

The English locomotive cab is, as you know, simply a steel apron, provided with windows in front, and a little roof on top, covering only about two-thirds of the foot plate. In pleasant weather it certainly has some great advantages over our cabs. An engine driver may sit on his box and look out without straining in that almost impossible position which he has to assume in an American cab, where, unless he is an abnormally "long-coupled" man, he cannot keep his hand on the "throttle" and have his head out of the window of the cab at the same time. However, we could not use these English cabs in America in severe winter weather, and, *per contra*, I presume that English engine drivers would find more objections than points of advantage in one of our cabs.

Only two prominent railways in England, the London & Northwestern and the Northeastern, are making use of compound engines, and it is not altogether strange that the compound engines have not come into more general use in England, for in passenger work the service required of the engines does not leave much opportunity for compound engines to show economy, the service usually requiring such high speed; and in freight service the maximum loading of the engines is so much under their hauling capacity that there is rather a meager chance there. On the London & Northwestern the Webb compound system is the only one in use, and the fact that it meets with high approval on that road is not a conclusive argument to locomotive superintendents of other roads that it is a good thing. Mr. Worsdell's engines, on the Northeastern line have met with high favor on that line, and the same system having been in use so generally, and with such good success in many other parts of the world, commends that system to more general favor; but, partly for the reason already explained, and because the English people are, beyond a doubt, the most conservative in the world, the Worsdell two-cylinder compound is not in use off Mr. Worsdell's own road.

Generally speaking, there are three classes of engines in passenger service in England: First, the "singles," that is, engines with a double truck in front and a single pair of driving wheels of 7 feet to 7 feet 6 inches in diameter and a trailing wheel; second, the 8-wheel engine, with 4 driving wheels coupled, usually 6 feet to 7 feet in diameter, and the double truck in front; third, the 6-wheel engine, with 4 driving wheels, and a single or "pony" truck in front. The first mentioned of these engines was, until recent years, the most popular class on high-speed passenger trains, but little by little they are giving away to the 4-wheeled coupled engines, because deficient in starting power and in climbing grades. They are very smooth running engines, and, when they get a train in motion, are probably as economical an engine as was ever designed. The third class mentioned are used only on light trains, such as branch passenger lines, and to a certain degree in suburban service.

For freight service practically only one class of engines is used throughout England, an engine with 6 driving wheels coupled, of moderate diameter, say 50 inches. These engines are not unlike our 6-wheel switching engines, only that the driving wheels are somewhat larger. These engines are also being used to some extent for switching purposes, and a 4-wheeled coupled engine is also used in switching service.

In the English service the pooling system is not in use, the engines being assigned to the men, or vice versa. Except, therefore, when more than one crew is assigned to an engine, the engine mileage is much under that of many railways of this country. Of course the engines last a longer time, and, in fact, one not infrequently sees engines built in the 60's and 70's in regular service to-day.

Each of the principal lines, with few exceptions, concentrate all its heavy locomotive repair work and its new work at one shop (this centralization is easy on account of the small distance between extremities); and as the locomotive equipment in England usually amounts to one engine per mile of railway, it will be readily seen that the larger lines operating from 800 to 3,000 miles have got a larger locomotive equipment to maintain and renew in one shop than many American railways have in several. Noteworthy, too, are the arrangements made at all shops to cook the meals of the men. Both breakfast (for the men go to work at 6 o'clock and have breakfast from 7:15 till 8) and dinner are cooked for the men free of charge, and usually soup and coffee are furnished by the companies. Large rectangular sheds usually take the place of our roundhouses. They contain under roof one, two or more turntables, which are entirely floored over, around which radiate the tracks, usually 24 in number. These are called "running sheds," and some are very large, accommodating over a hundred engines.

Passenger Cars.

On special and through express trains a good many modifications of the ordinary compartment cars exist, some being provided with little lavatories adjoining, some arranged so that two or three compartments are connected together, while in others, adapted to cater to the American tourist travel, have longitudinal aisles. Aside from the prejudice which not unnaturally exists against adopting American innovations, the real reason that the American style of cars has not come into more favor is due to the limit on width and height to which English car builders are held. These limits are approximately 8½ feet for width and 13 feet for height, which makes the car with longitudinal aisles either deficient in seating capacity or very cramped and something like our narrow-gage equipment, and the limit of height allows no "clear story" and hence makes a long aisle or "corridor" car look badly.

The compartment system has certain nice features despite all that has been said against it, and it is not hard to see why Englishmen like it. Our chief interest in considering the system is in knowing its merits and demerits to the railway companies. One advantage claimed for it, it certainly does not possess to any great degree—that is, the advantage of rapid loading and unloading. At terminal stations, where *all* get out, the unloading is very rapid, in fact, a train is unloaded as rapidly as a single compartment, but at the intermediate stations it is safe to say that more time is consumed than with us in opening and shutting doors and in waiting for passengers to find seats, for there is no chance to go in and find your place after the train is in motion. Several important English railways are doing away with the second-class service, retaining only first and third-class. The class system adds a good deal to the difficulty of making up trains and requires very painstaking superintendence in order that room may be provided for first, second and third class passengers, smokers and non-smokers, and luggage vans (baggage cars) sufficient to carry an indefinite amount of luggage, in addition to which there must often be provided special cars for horses and hunting dogs.

The English compartment cars with low studded ceilings would prove very hot in our long journeys and great extremes of heat in summer. On the other hand, we could learn a lesson from the good taste and neatness with which they are fitted up. The first-class compartments, as well as the second or third class, are always neat but not gaudy, whatever outlay is made being in the line of giving the passenger more room, more cleanliness and more comfort. No money is wasted in beveled mirrors put in all sorts of useless places, nor is there a superabundance of embossed and figured plush calculated to catch all the dirt in sight and yet not show it very much. The nicest cars are always in sober good taste, the seats (first class) luxuriously comfortable and upholstered in dark blue cloth or similar material; above the high upholstered backs are neatly exhibited, in most cases, a series of photographs of points of interest on the line, and above this the wall and ceilings are painted a plain neat color.

Freight Cars.

Freight cars in use in England do not exceed 17 feet in length over all. They are mounted on two axles, and about 90 per cent. have sides about 3 feet high; the other 10 per cent. are composed of ordinary box cars, refrigerator cars, stock cars, flat cars, and cars of special designs. The side sills of the car usually extend out beyond the end sill so as to form deadwoods. The cars are coupled together with a 3-link coupling which allows a foot or more loose slack between the cars. The coupling and uncoupling of the cars are usually done now by a pole provided with a sort of corkscrew hook on the end by which the train or yard men quickly, and, it must be said, exceedingly dextrously, couple or uncouple the cars. Cars weigh from six to seven tons and are made for a capacity of ten tons. When carrying high class freight or merchandise a yellow or black tarpaulin bearing a specific number and the initial of the road is spread over the contents of the car and securely buttoned down over the sides, and it speaks well for the immunity from trespass and theft on English roads that this tarpaulin seems to be adequate protection for the contents of cars. The style of cars used has made the handling of freight at terminal stations an entirely different problem from what it is with us. It is common in England for a large freight-house to cover several acres of ground, which may be partly or wholly under roof and have a capacity for several hundred cars. The various tracks on which the cars stand are usually connected with the main switching track by a series of turntables, which have to be long enough only to accommodate the short wheel base of the cars, say 13 feet. The yard is dotted around with capstans working by electricity, hydraulic pressure or by a clutch with a line of shafting, and a man with a rope and a hook can throw loaded and empty cars about with astonishing ease. The platforms between the tracks are provided with a series of jib cranes, and heavy freight is picked right up out of the car and loaded onto wagons, or vice versa.

American railway men may express some surprise at what they suppose to be extreme conservatism on the part of English railway managers, in not adopting our big capacity cars hung on bogy trucks, but when one sees the millions of dollars which have been spent in terminals provided with numberless turntables and cranes, not to mention similar facilities at smaller stations, which in the aggregate would amount to immense sums of money, one does not wonder at what we suppose is want of progressiveness in our English cousins, but one is rather led to the conclusion that it is practically impossible, considering all things, to make the change. One advantage in the use of the small cars, which is more important in England than it would be with us, lies in the fact that a very much smaller proportion of the total traffic is composed of bulk freight handled in large quantities to one consignee. Under the American system of rates the carload is the unit, and the merchant who cannot get his freight by the carload or send it to important distributing points in that way, cannot compete long with his bigger neighbor; while in England the unit is the ton, and for that reason, and because the distances between distributing points is very short, a very large proportion of material handled is in what we call less-than-car-load lots. Furthermore, although English roads agree among themselves not to send a car out of a station with less than one ton of freight in it, it is not uncommon for them to do so. In America it has been found, when loading out less-than-car-load freight from distributing points, that in order to give our large cars anything like a fair load, it is frequently necessary to load freight for several stations into a single car, while under the English system of smaller cars this disadvantage can of course be easily overcome.

Although the English car, even when loaded to its full capacity, does not weigh to exceed 17 tons, and when loaded with ordinary freight, 10 or 12 tons, on an average not over 10 tons, yet 45 cars are considered a long train for one engine, and 35 are the usual limit for "mineral" trains. The reason for this is probably not due to want of capacity in the engines nor to bad grades, but to the great amount of loose slack between the cars, which would make "break-in-twos on long trains very liable, and to the fact that the entire "braking" on the train must be done by the engine in front and from the guard's van in the rear. The brakes on English cars are simply hand brakes applied in manner similar to what is so familiar in the mining regions—a long lever on the side which is lowered and pressed down to apply to the wheels. This system of brakes is very convenient in switching, but it precludes the possibility, even if it were desirable, of men setting brakes on cars while in rapid motion. Thus far air or vacuum brakes have not been put onto freight cars, except on such as are used wholly or partially in passenger service. On long trains, especially where bad grades are encountered, it is not uncommon to put on additional brake vans (caboose cars) in the middle of the train, each van being in charge of a guard.

*Synopsis of a paper read to the Western Railway Club, Jan 15.

Some Good Advice to Traveling Engineers.

At the convention of the Traveling Engineers' Association, held in Denver last fall, the members were addressed by Mr. E. T. Jeffery, President and General Manager of the Denver & Rio Grande Railway. As is well known, Mr. Jeffery worked his way up in railroad service from the foot of the ladder through the mechanical department, and his extensive practical experience enabled him to give his hearers an instructive as well as interesting talk. The following is a synopsis of his remarks:

Your Association, though young, is one that in the future can make itself of vast importance to railway interests. It can make its influence felt throughout the length and breadth of the land, and at no time in the history of our country, and especially in the history of the railways of the country, has there been such a pressing necessity for thoughtful, earnest, conservative and capable workers in the railway ranks as there is now. The country has passed through a great crisis in the last twelve or fourteen months, one that is unprecedented in the history of this or any other land. During the first six months of 1894 the railways of this country lost, according to the best estimates, about $100,000,000 in revenue, as compared with the corresponding six months of 1893. The averagereduction in earnings, predicating the figures upon returns from 112 roads, is very nearly 25 per cent. You can, if you turn the figures over in your mind for a few moments, realize the vast importance this immense reduction in the earning power has upon the interests we all serve.

I wish to take this occasion to suggest that there is no higher duty resting upon all of us who are railway employees than to strive in every way to enable the corporations we respectively serve to continue as well as may be under these very trying circumstances, to keep out of bankruptcy where they are solvent, and to plunge no deeper into it where they have already failed. I have often said, in conversation and in public, that a railway manager, in and of himself, is a powerless employee. I know that the conception of a railway president and railway manager is one who can command results, one who can take conditions as they come to him, molded perhaps somewhat by his influence, and from those conditions extract through his now capacity and strength of character results satisfactory alike to the railway employees generally and to the owners of railway properties. But no greater mistake ever dwelt in the minds of men. The money is earned by the efforts of the commercial branch of the railway, fair dealing with the public, satisfaction to the public, safe and desirable facilities for the public to use, prompt movement for persons and property. In these ways and through these channels revenues are derived. But it is one thing, my friends, to earn money, and another thing and a more important thing to expend it judiciously and honestly, and a railway corporation expends money through every employee upon its payrolls; and most of all are its expenditures influenced for good or for bad by an intelligent and capable or an ignorant and incapable body of locomotive engineers.

An intelligent, reliable and capable engineer, well experienced in his calling, can make or lose for the railway company $1,000 a year in the operation of his locomotive; the closest scrutiny should be given his work so that his action may be checked if it should be too extravagant, or that his savings may be increased by encouraging words and counsel, if he be capable and efficient. I have noticed by the papers that you have a committee to consider the economical consumption of coal. It is a regret to me that I have not at hand the enormous consumption of coal on the railways of the United States, and the vast sum of money that it annually costs. Assume that the amount is, if you please, $100,000,000. It may be more or less. I merely cite these figures to illustrate the point in my mind. Saving 1 per cent. would mean $1,000,000. Not $1,000,000 by extra physical effort, because it means to shovel fewer tons of coal; not $1,000,000 extorted, as it were, from the railroad company, because it is to the railroad company's interest to have that $1,000,000 worth of coal in its bins; not $1,000,000 saved by having the engines haul fewer cars and move fewer tons of freight or cause delays to passenger trains—but it is simply $1,000,000 saved by brain power, thoughtful, intelligent consideration of the use of fuel and equally thoughtful, intelligent consideration in its use. Again, in the matter of oil, what opportunities there are for wastefulness or otherwise; and in the matter of all other supplies—and the engineer is captain on his engine—in the matter of all other supplies what opportunities for careful or extravagant use! Now, as I said before, the careful use of these articles is not brought about by physical exertion. It does not wear out a man to accomplish these things. It does not tax his physical strength one iota; on the contrary it relieves it; but it does require the intelligent, thoughtful use of these articles, to the end that the corporation being served, and loyally served, shall be benefited thereby.

I am dwelling on these things at some length, but it is useless, for I know that your minds have turned to these subjects quite as much as mine. The principal object I have in referring to them in connection with the great loss in revenues of the railway companies, is to emphasize that the best way for all of us in our position on railways, in all ranks of the service, to keep the wage question undisturbed, to avoid contentions between railway corporations and employees, is to aid at all times, but especially during these trying hard times, in saving every dollar that loyal and faithful service can save.

An old law of Mississippi allows damages of $50 per day against railroads failing to place at public crossings a sign of certain dimensions containing the words "Look Out for the Locomotive." The Mobile & Ohio has failed for years to comply with this requirement, literally, although it had signs of much larger dimensions bearing the words "Railroad Crossing." A suit was recently brought against the road for damages amounting to some $500,000 for failure to comply with the law. The Supreme Court has just decided that the signs maintained by the company met all requirements of the law.

Freight Car Truck Bolsters.

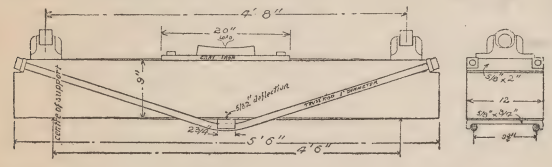
The report of the Committee of the Master Car Builders' Association in 1893 on freight car truck frames, devoted considerable space to discussing the weaknesses of various types of truck bolsters, and drew special attention to the faults of wooden bolsters, prominent among these being the trouble resulting from the rods in such bolsters elongating and breaking down in service. The report of this Committee was published nearly in full in the NATIONAL CAR AND LOCOMOTIVE BUILDER for July, 1893. Reference to it is again made at this time to draw attention to a new design of pressed steel bolster, which we illustrate herewith, and which is made by the Schoen Manufacturing Company of Pittsburgh. It is known as the Diamond pressed steel bolster, and the tests of it, which have been conducted by the makers and by the R. W. Hunt Company, show that it is possessed of remarkable strength, and that under heavy loads it is deflected but very little. The results of these tests appear beneath the engraving of this bolster on this page.

Referring again to the report of the M. C. B. Committee, we make the following quotation: "The Committee made a personal inspection of 61 different styles and makes of freight trucks largely composed of wood transoms and bolsters, and every truck was more or less defective on account of the parts shrinking, causing loose bolts, and many other parts split, checked, cracked, splintered, worn away, warped, etc., and we therefore recommend that timber not thoroughly seasoned is unfit for car construction to produce economic results, and as builders cannot use seasoned timber, we therefore recommend the introduction of steel or wrought iron in place of green, unseasoned timber."

This report drew a good deal of attention to the cost of maintaining truck bolsters of the various types, and the fact that a stronger and better designed bolster would effect considerable saving in repairs has very properly impressed itself during these hard times on the minds of railroad officers. The committee made a number of tests of the different types of bolsters in use, and we reproduce the illustrations of these bolsters from the committee's report, and also the results of the tests, which appear beneath each engraving.

As showing the general weakness of truck bolsters and their inability to properly withstand the loads imposed on them, we quote again from the report as follows: "In regard to the carrying capacity of the different designs of bolsters, it is a well known fact that fully 50 per cent. of those applied under cars prior to 1887 have no factor of safety for carrying a load equal to or greater than the intended capacity of car, without deflection at the center sufficient to transfer a large per cent. of the load from center plates to side bearings, producing expensive and dangerous results familiar to many of us. You will note that the majority of members express themselves as having difficulty with weak bolsters, and a number also stated the defect had, in their opinion, caused derailments on account of trucks not curving freely."

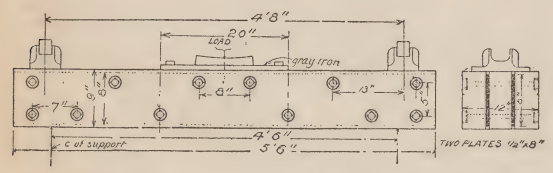
Following are the drawings of the bolsters tested, and the results of the tests:



WOOD BOLSTER TRUSSED OUTSIDE OF SIDE-BEARINGS; FOR IRON BODY-BOLSTER.

Capacity of Car, 40,000 *pounds.*

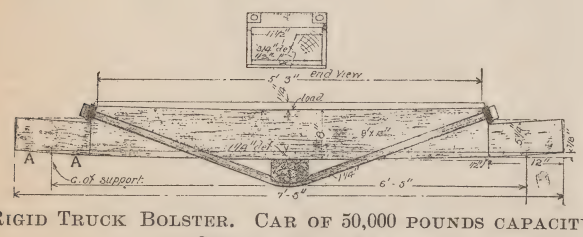
Load, pounds.	Deflection, inch.	Permanent Set, inch.
20,000	5-32	0
22,000	5-16	1-16
25,000	3-8	3-32



COMBINATION BOLSTER (2½-INCH IRON PLATES) FOR IRON BODY-BOLSTER.

Capacity of Car, 40,000 *pounds.*

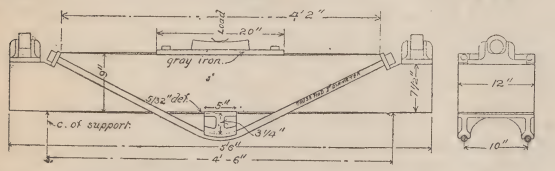
Load, pounds.	Deflection, inch.	Permanent Set, inch.
20,500	3-32	0
22,000	1-8	0
25,000	7-32	0



RIGID TRUCK BOLSTER. CAR OF 50,000 POUNDS CAPACITY, IN SERVICE TWO YEARS.

A, A, *Springs: Inner Coil ½ inch Permanent Set.*

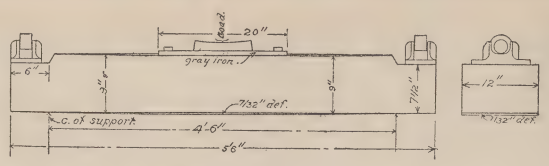
Load, pounds.	Deflection, inches.	Permanent Set, inches.
25,000	1 3-8	1 1-4



WOOD BOLSTER TRUSSED INSIDE OF SIDE-BEARINGS; FOR WOODEN BODY-BOLSTER.

Capacity of Car, 40,000 *pounds.*

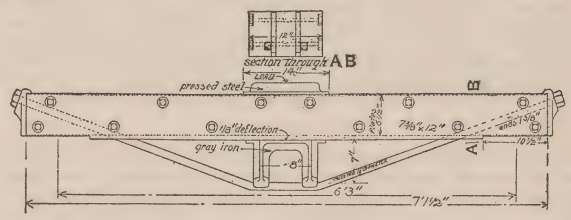
Load, pounds.	Deflection, inch.	Permanent Set, inch.
20,500	5-32	0
22,000	7-32	1-32
25,000	5-16	1-16



ALL WOOD BOLSTER; FOR WOODEN BODY-BOLSTER.

Capacity of Car, 40,000 *pounds.*

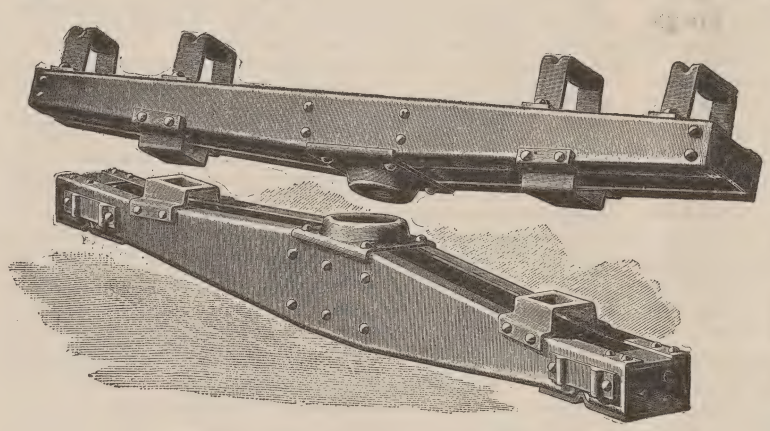
Load, pounds.	Deflection, inches.	Permanent Set, inches.
20,500	7-32	1-32
22,000	9-32	1-16
25,000	13-32	1-8



COMBINATION TRUSSED BOLSTER. TWO ¾-INCH PLATES, 6½ INCHES WIDE. TWO TRUSS RODS, 11⅛ INCHES DIAMETER.

Capacity of Car, 60,000 *pounds.*

Load, pounds.	Deflection, inch.	Permanent Set, inch.
15,000	1-32	0
20,000	3-32	0
25,000	1-8	0
35,000	9-64	0



THE DIAMOND PRESSED STEEL BOLSTER.

Capacity of Car, 60,000 *pounds.*

Test by makers. Load, pounds.	Deflection, inch.	Permanent Set, inch.	Test by R. W. Hunt Co. Load, pounds.	Deflection, inches.	Permanent Set, inches.
26,000	.00	.00	26,000	.02	....
46,800	.08	.00	36,400	.04	....
55,900	.11	.00	46,800	.09	....
65,000	.14	.00	55,900	.11	...
75,400	.16	.00	65,000	.12	....
85,800	.19	.00	75,400	.15	....
94,900	.21	.00	85,800	.19	....
100,100	.24	.00	94,900	.21	....
110,500	.25	.00	100,000	.23	....
120,900	.30	.00	105,800	.25	....
124,800	.34	.00	110,300	.27	....
136,500	.40	.00	114,400	.27	....
			120,900	.31	....
			124,800	.37	....
			130,000	.44	....
			136,500	.46	....
			143,000	.57	.40
			149,500	.82	.62
			156,000	1.17	.97
			162,500	1.95	1.75

It will be seen that of the bolsters tested by this committee only two sustained a load of 25,000 pounds without permanent set, but from an engineering standpoint a truck bolster should be capable of carrying about three times the load that it is rated to carry. The two bolsters which stood the tests without permanent set are combination bolsters; that is, wooden bolsters reinforced with iron plates. This, however, does not appear to be a theoretically satisfactory arrangement, for such a combination will be at its best only while it is new, and will begin to deteriorate from the time it is put in service. Its stability depends upon all the bolts remaining tight, but obviously the wood, however well seasoned, will begin at once to shrink and the bolts will begin to get loose. This weakness will of course not appear in a bolster made entirely of metal.

The Diamond truck bolster shown in the last engraving is made of steel channels deeper in the middle than at the ends. It can be made to save from 300 to 500 pounds of weight per car as compared with the combination bolster, and the manufacturers say that it can be furnished for little if anything above the cost of the trussed or composite bolster. This bolster constructed of good steel will evidently outlast a car.

This steel bolster has been very carefully designed to meet all the requirements of this member of a car, and is the result of many years' experience by the makers in this particular branch of industry. It is so constructed that it will interchange with other standard forms of bolster without involving much expense. The width can be easily proportioned as desired by simply making the flanged tie plates of the proper lengths to produce the desired width. The channels composing the bolster are riveted together by hydraulic pressure, thus insuring that the rivets fill the holes and interstices. The bolster is made in several parts, as shown, to facilitate repairs.

The weakness of some of the ordinary types of truck bolsters frequently causes the car to rest heavily on the side bearings, and this is a well known cause of increased resistance to the hauling of trains. It has been estimated that in some cases three more loaded cars might be added to a train and successfully hauled if this element of resistance was eliminated. The bolster here illustrated is evidently capable of accomplishing this purpose, as well as of insuring greater safety and reduced expense of repairs.

The Mannesmann Process for Rolling Steel Tubes.

President Morton, of the Stevens Institute of Technology, in writing in the *Stevens Indicator* on the "Mannesmann process for rolling steel tubes," says that this is the most remarkable discovery in mechanics since that involved in the Giffard injector. By this process a hot steel billet is passed in between two conical rolls set with their axes at a small angle to each other, and comes out on the other side as a tube with uniform walls, without the use of a mandril or anything else to make the central opening. This process in fact realizes the familiar Hibernian description of the means of making a cannon—"You take a hole and cast metal round it."

In the Mannesmann process it seems as if a hole were taken to serve as a mandril, and the steel were rolled on it into a tube. So far as the process admits of a popular explanation, the following would seem to be the best that can be given. If a uniform bar of steel be stretched lengthwise it will gradually thin down, by the yielding of the surface layers, until it breaks. If, however, the bar be much harder on its surface than in its interior, then the interior layers or substance will yield first, developing a cavity along the axis of the bar. It may be supposed that the first effect of the rolls on the hot billet is to harden its surface, and then the elongating strain causes a parting of the interior portions and the formation of a tube. Tubes made in this way, from the size of a knitting needle to a diameter of 10 inches, were exhibited at Chicago last year. If a billet is drawn down beforehand at its ends and at one or more points in its length, to the diameter which it would have after passing the rolls, the result would be to produce a tube closed at both ends and wherever else the billet was drawn down. The tube in this case must be vacuous except so far as it may contain gases extracted from the steel during the rolling process.

Our Directory

OF OFFICIAL CHANGES IN JANUARY.

We note the following changes of officers since our last issue. Information relative to such changes is solicited.

Allegheny & Kinzua.—M. D. Murray is appointed Superintendent, with office at Bradford, Pa., succeeding C. V. Merrick.

Bay City & Alphena.—Name changed to Detroit & Mackinaw. J. D. Hawks is Vice-President and General Manager, and G. M. Crocker is Auditor and Purchasing Agent.

Blue Ridge.—H. C. Beattie is appointed Receiver, with office at Anderson, S. C.

Boston & Albany.—Chester W. Bliss is appointed Assistant General Superintendent with office at Springfield, Mass.

Brooklyn Union Elevated.—General Manager Anthony Barrett has resigned and is succeeded by George W. Wingate.

Buffalo & Susquehanna.—John B. Campbell is appointed Superintendent of Motive Power, with office Austin, Pa.

Carrabelle, Tallahassee & Georgia.—S. D. Chittenden is appointed General Manager, and H. P. Simmons Assistant General Manager, with office at Tallahassee, Fla.

Chicago & Northwestern.—E. M. Herr is appointed Assistant Superintendent of Motive Power.

Cincinnati, Lebanon & Northern.—F. E. Voight, Master Mechanic, has resigned.

Cincinnati, New Orleans & Texas Pacific.—Master Mechanic Geo. W. Cushing has resigned, and is succeeded by J. P. McCuen.

Columbus, Sandusky & Hocking.—H. O. Pond, Superintendent, has resigned.

Des Moines Union.—W. H. Whittaker is appointed Master Mechanic.

Duluth & Winnipeg.—General Manager William Fitch is appointed Receiver, with office at Duluth, Minn.

Findlay, Fort Wayne & Western.—C. M. Bissel is elected Vice-President and General Manager, vice C. G. Patterson, resigned.

Florida Southern.—General Manager Robert S. Seibert is appointed Receiver.

Fort Worth & Denver City.—Morgan Jones is appointed sole Receiver.

Great Northern.—J. M. Barr has been appointed General Superintendent.

Illinois Central.—F. B. Harriman, Superintendent of the Freeport Division, has been transferred to Dubuque, Ia., with extended jurisdiction to Fort Dodge, Ia.

Iowa Central.—B. Reiley is appointed Master Mechanic.

Jacksonville, Tampa & Key West.—General Superintendent W. B. Coffin has assumed the duties of Purchasing Agent.

Kansas City, Pittsburgh & Gulf.—General Manager Richard Gentry has resigned, and the duties of the office have been assumed by President E. L. Martin.

New York Central & Hudson River.—George H. Burrows, Superintendent of the Western Division, has resigned, and is succeeded by James P. Bradfield.

New York, Ontario & Western.—Edward Canfield has been appointed General Superintendent, vice James P. Bradfield resigned.

Norfolk & Western.—S. K. Dickerson is appointed Master Mechanic at East Radford, Va.

Northern Pacific.—W. S. Clarkson is appointed Master Mechanic at Missoula, Mont., vice A. Ha rity, resigned. F. N. Regan is appointed Master Mechanic at Fargo, N. D., vice J. E. Phelan, resigned.

Oregon Railway & Navigation Company.—Master Mechanic E. B. Gibbs has resigned and is succeeded by J. F. Graham.

Pensacola Terminal.—J. H. McCleary is appointed General Manager.

Philadelphia & Reading.—E. E. Davis is appointe d Assistant Superintendent of Motive Power.

Poughkeepsie & Eastern.—General Manager W. H. Sheldon died January 19th.

Quincy, Omaha & Kansas City.—General Manager Amos Green has resigned, and is succeeded by J. M. Savin.

San Antonio & Gulf Shore.—J. M. Phillips is appointed General Superintendent with office at San Antonio, Tex.

Texas & Western.—E. A. Campbell is appointed General Manager.

Toledo, St. Louis & Kansas City.—D. D. Davis is appointed Receiver.

Winona & Southwestern.—Name changed to Winona & Western. J. J. Mahoney is General Superintendent.

Wanted.

WANTED—By a large manufacturer, some new specialty to manufacture for the railroad trade. Address "ADVERTISER' care of the NATIONAL CAR AND LOCOMOTIVE BUILDER.

NATIONAL CAR AND LOCOMOTIVE BUILDER

MARCH, 1895.

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The Missouri, Kansas & Texas is erecting a 40-stall roundhouse at Denison, Tex.

The Hutchins Retrigerator Car Co. has ordered 200 cars of the Wells & French Co.

One hundred men have been added to the force of the Wagner car shops at Buffalo.

The Baltimore, Chesapeake & Atlantic is in the market for a few compound locomotives.

The Central Railroad of Georgia is about to build 100 cars at its shops, at Savannah, Ga.

The Minneapolis & St. Louis is about to enter the market for five day coaches and 200 box cars.

The Delaware & Hudson Canal Company is building two first-class passenger cars at its Carbondale shops.

It is reported that the machine shops of the Chester & Lenoir railroad are to be located at Lincolnton, N. C.

The Delaware, Lackawanna & Western has been receiving bids for 500 coal cars. The order is "hanging fire."

The Delaware & Hudson has ordered three 8-wheel passenger engines of the Schenectady Locomotive Works.

A number of freight cars are being built by Messrs. Murray, Dongal & Co., of Milton, Pa., for the Pennsylvania Midland.

The Illinois Central has ordered 1,300 freight cars of the Haskell & Barker Car Company; 300 of these will be refrigerator cars.

The Southern Railway has ordered 350 ventilated fruit cars of the Ohio Falls Car Company and 150 of the Elliott Car Company, of Gadsden, Ala.

The Concord & Montreal is going to put on a new train, and is in the market for one combination car, three passenger coaches and one parlor car.

It is calculated that about 2,000 locomotives, 3,000 passenger coaches and 36,000 freight cars will be required for the equipment of the Siberian Railway.

The Farrell Car Line Company, of Omaha, Neb., have placed orders for a number of tank cars with the Memphis Car & Foundry Company, of Memphis, Tenn.

To lighten the labor of horses the experiment is being tried of laying flat iron rails for the use of wagons on a highway in the province of Hanover, Germany.

The Delaware, Lackawanna & Western has given an order to the Dickson Manufacturing Company, of Scranton, Pa., for two 8-wheel passenger locomotives.

The Duluth & Iron Range Railroad has ordered 300 ore cars of the Pullman Car Company. One hundred similar cars are also ordered of the Duluth Manufacturing Company.

The Pennsylvania Railroad is about to order 1,000 gondola cars for the lines west of Pittsburgh. The report that this order was placed with the Ohio Falls Car Works is denied.

The Hon. W. W. Thomas, ex-Minister to Sweden and Norway, says that, relative to its size and population, the railroad system of Sweden is the most complete in the world.

The Toledo, Ann Arbor & North Michigan has been considering the purchase of new freight cars since last fall. It is now stated that orders for 565 such cars are about to be placed.

Dr. J. W. Weaver, of Jamestown, N. Y., a passenger on a New York, Lake Erie & Western train, fell from the train two miles west of Goshen, Feb. 16, and sustained a compound fracture of the skull.

The Boston & Maine and the Maine Central have ordered 9 and 15 vestibuled coaches, respectively, of the Pullman Company. These cars are intended for the through trains over these lines between Boston and Eastern points.

The Michigan Central Railroad has adopted a plan by which passengers on some of its trains are provided with lunches served in baskets at some of the principal stations, and which may be ordered in advance by telegraph.

The St. Louis, Alton & Terre Haute has awarded to the Mt. Vernon Car Company the construction of 75 42-foot furniture cars and 50 60,000-pound ordinary box cars, both to be equipped with automatic couplers and Westinghouse air brakes.

Mr. Edward S. Savage has been appointed receiver of the Johnson Railroad Signal Co. Mr. Henry Johnson, General Manager of the company, is reported as stating that the company was almost without assets, while the liabilities were $110,000.

The New York Railroad Club varied its usual proceedings at its February meeting, which was held on the evening of the 21st. A very entertaining concert was given, and smokers were fully privileged to indulge in the weed to their hearts' content.

Probably the largest fire insurance policy in existence, or ever written, is that covering the property of the Santa Fe Railway Company. It was issued by the Phœnix Fire Insurance Co. of London, England, is in amount $17,000,000, and takes a premium of $170,000 to carry.

Late in January the Boston & Albany ordered 20 locomotives from the Schenectady Locomotive Works. The order is for 10 freight and 10 passenger engines. The passenger engines will be 8-wheelers, and the freight engines of the consolidation type; similar to the engines ordered from the Schenectady Works some time ago.

The Memphis Car and Foundry Company, of Memphis, Tenn., has closed contracts with the Illinois Central, Louisville & Nashville, Tennessee Midland and Kansas City, Memphis & Birmingham railroads for a portion of car wheels and castings required by those roads during the year.

The Southern Pacific has ordered 500 box cars and 18 passenger coaches of the Pullman Co., and 700 fruit and 60 refrigerator cars of the Ensign Mfg. Co. This road is building six new express and baggage cars at its New Orleans shops. These cars are to be of the latest design, and will be lighted by Pintsch gas.

An eastbound express train on the Baltimore & Ohio jumped the track in consequence, it is said, of a defective frog at Woodell, near Washington, Feb. 2, and crashed into the rear of a freight train on the siding. One brakeman was killed and another seriously injured. None of the passengers were seriously injured.

For some weeks it appeared as if a strike of engineers was about to occur on the Southern Pacific in consequence of the reduction of wages mentioned in this paper several months ago, but about Feb. 15 it became apparent that the men had been given wise counsel, and were disposed to heed it. Thereafter the talk of a strike ceased.

Mr. C. E. Turner, Superintendent of Motive Power of the Buffalo, Rochester & Pittsburg, is building a passenger engine at the Lincoln Park shops of that road. Its construction is well advanced. It has cylinders 18-inches by 24-inches, with 68-inch wheels. It has an electric headlight, and aluminum outside finishings have been used.

The Baltimore & Ohio uses cast iron rocker-arms on all locomotives with balanced valves, and these have given excellent satisfaction. Mr. Hazelhurst, the General Superintendent of Motive Power of the road, informs us that, in his opinion, it is questionable whether cast iron is the best material for this purpose. He thinks that probably cast steel should be used, but its cost is much in excess of cast iron.

The Lehigh Valley is building two passenger engines at its shops at South Easton, Pa., similar to the passenger engine built last July at these shops. This road has ordered 30 locomotives of the Baldwin Locomotive Works, five of these are to be passenger engines of the simple 8-wheel type with cylinders 18 inches by 24 inches, and 25 are to be 10-wheel freight engines.

We announced in our last issue that the Boston & Maine was in the market for 29 passenger cars. It is now reported that 20 new locomotives are also to be ordered. It is said that the Manchester Locomotive Works will probably get the order. It is also announced that several hundred freight cars (between 400 and 600) are to be added to the road's rolling stock equipment.

The boiler of a locomotive on the Norfolk & Western exploded at Roanoke, Va., Feb. 6. The engine was hauling an eastbound freight train and was passing on to a side track when the disaster occurred. The fireman was instantly killed, and the engineer died later from his injuries. He was blown to the river bank, some distance away, and his body was not found for 35 minutes. Both men lived in Roanoke.

The Philadelphia, Reading & New England has ordered 150 coal cars of the Union Car Company, of Depew, N. Y. These car works are very busy at present, employing a full force in all departments, with orders for 500 cars for immediate delivery. An addition to erecting shop No. 1, 126 by 360 feet, is to be built, and this will give this building a total length of 700 feet. There will then be room under cover for over 150 cars.

MAR 4 1895 PATENT OFFICE

Among the arrivals in San Francisco a few days ago by steamer from the Orient were two officials of the Siberian Railway, who have come to America to study the railway system of this country. The officials—the Vice-President and Chief Engineer of the road—will visit locomotive works and car shops and carefully study the operation of some of the large roads here. They say they expect to adopt many American ideas.

The court has granted an order permitting the Georgia Central receivers to buy 1,500 tons of 70-pound steel rails for use on the Georgia Central main lines, and 5,000 tons of 63½ pound rails for the Southwestern Railroad. These rails will cost about $125,000, and are much needed to protect the property from threatened deterioration. It is proposed to put the worn rails taken up on the branch lines of both the Central and Southwestern companies.

The New York Central & Hudson River Railroad is about to order in the neighborhood of 3,000 of its standard box cars. The construction of these cars was fully illustrated and described in the NATIONAL CAR AND LOCOMOTIVE BUILDER for May and June, 1894. As we go to press on Feb. 27 the exact number of the cars to be ordered has not been settled, and the contracts have not been signed; but the orders will doubtless soon be placed, and the number will be approximately that named above.

The Brooks Locomotive Works, of Dunkirk, N. Y., have received advices from Rio Janeiro that the locomotives recently shipped to that country are giving eminent satisfaction. Only a few of these engines have yet been set up and shipped to the Brazilian Railway, but by July 1 all of them will be in use. The large order has been nearly filled. It is said that if these locomotives give satisfaction another large order from the Brazilian Government will be placed with the Brooks Works during the coming Summer.

The new union passenger station at Jacksonville, Fla., was put in use Feb. 4, although not yet completed. It is near the western limits of the city, about half a mile from the old Waycross depot, and, when fully completed will have cost $500,000. It is built of brick, glass and iron, and its car shed is 1,180 feet long and 168 feet wide. Four railroads at present have their terminals in it—the Savannah, Florida & Western, the Jacksonville, St. Augustine & Indian River, the Florida Central & Peninsular, and the Jacksonville, Tampa & Key West.

The heavy snows of February made all the roads that had Rotary snow plows put them to work, and caused all the officers of such roads to be very glad they had such an efficient means of opening up otherwise impassable stretches of track. The plows are in use all over the northern and western part of the United States, the first one having been built for the Union Pacific Railroad Company in 1887. Of the 62 rotary plows now in use in this country the Union Pacific Railroad has six and the New York Central two. The German Government owns one, and one is now being built in Copenhagen which when complete will be sent to Russia.

Mr. W. A. Stowell, General Manager of the Montpelier & Wells River Railroad, in a circular letter to engine men on economy in oil, states that "you are to use all the oil that is necessary, but I do wish to have you use less oil and more care. After experimenting a little you will find that these two ingredients (oil and care) well mixed together, make an excellent lubricating compound, and one that will go much farther than oil alone, the way you are now using it. If your eyesight is good and your judgment is what it should be, you will find that an occasional glance at the sight-feed will help you to make more miles to a pint of valve oil."

The folly of using old oil barrels for any purpose without thoroughly cleaning their interior was disastrously illustrated at the Westinghouse Electric Works at Brinton, Pa., Feb. 2. Several laborers were sent to the warehouse for certain castings which were stored in a barrel that had formerly contained wood alcohol. Gas had generated in the barrel. The men knocked in the head, and one lighted a match to look for the castings. A terrific explosion followed. The heavy castings were blown in all directions, some falling 50 feet distant, others passing through the roof. The men standing about the barrel were struck by the iron missiles, and their clothing was set on fire by the flash of the explosion. One man was killed and five others seriously injured.

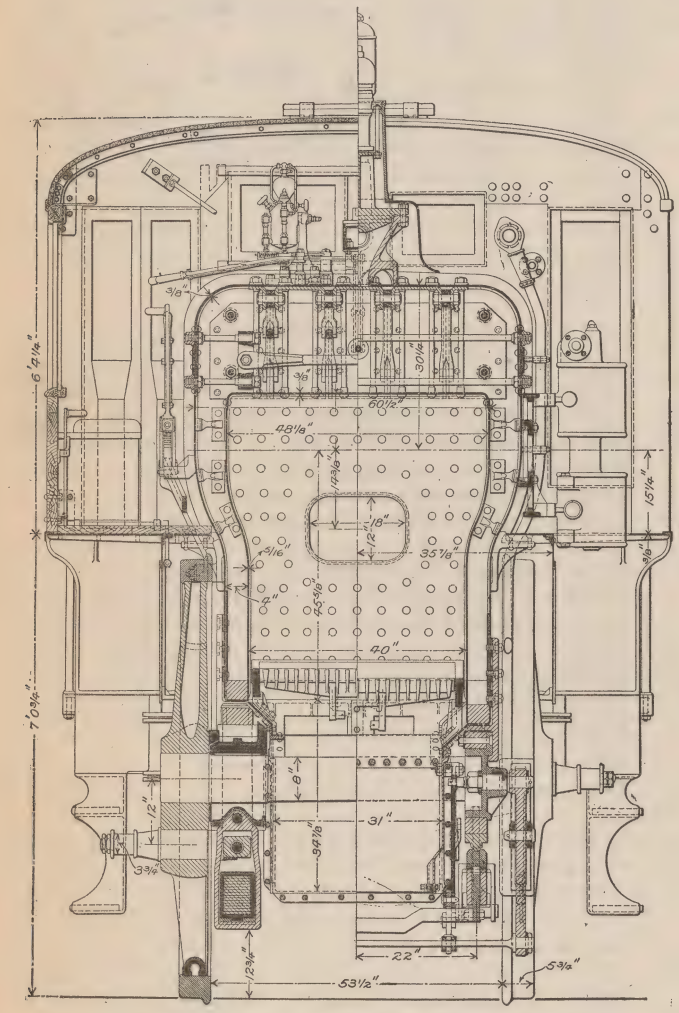
The Pennsylvania Railroad Class P. Locomotive.

The engravings on this page reproduce the general arrangement and some sectional drawings of one of the latest improved Class P. locomotives of the Pennsylvania Railroad. These engines are designed for fast heavy passenger service, and have drivers 80 inches in diameter, and cylinders 19 inches in diameter with a stroke of 24 inches. The total weight of the engine is 127,050 pounds, and the total weight of engine and tender ready for service is 197,000 lbs. The tender carries 7½ tons of coal and 3,000 gallons of water. The weight on the four drivers is 87,300 pounds, and the weight on the truck is 39,750 pounds. The driving wheel base is 7 feet 9 inches, and the total wheel base of the engine and tender is 49 feet 3¼ inches. The fuel is either anthracite or bituminous coal. The valves have a 6-inch travel and 1⅛-inch outside lap, with no lead.

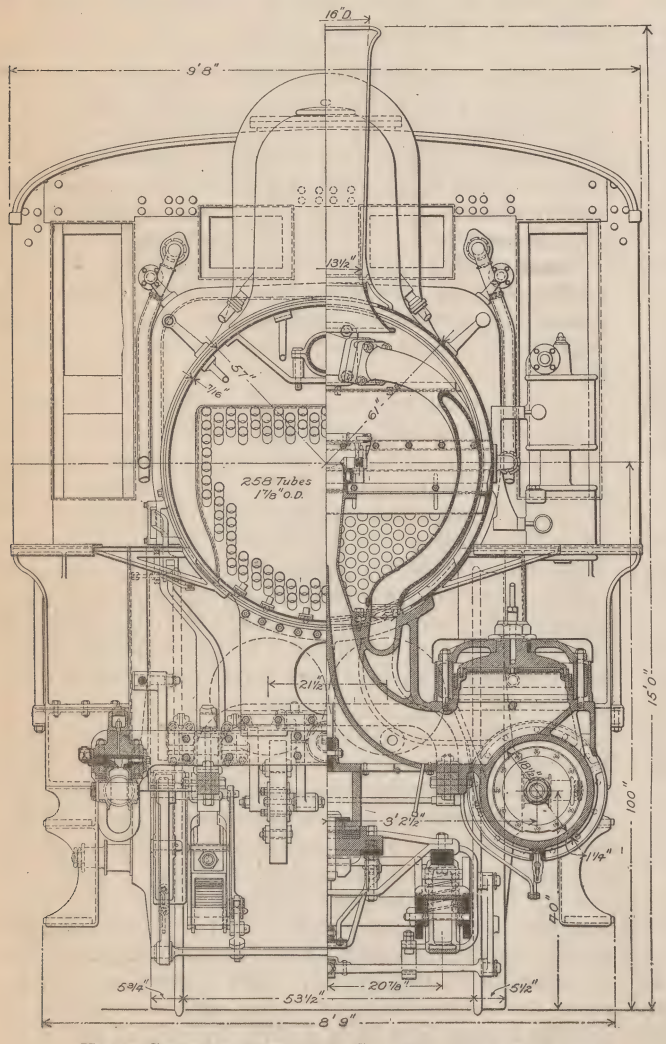
The boiler is of the Belpaire type with a straight top, and its barrel is 57⅞ inches in diameter. It is made of pressed steel plates $\frac{7}{16}$ inches thick. The firebox side and back plates are $\frac{5}{16}$ inches thick, and the crown sheet and back tube sheet are ⅝ inch thick, the front flue sheet being ½ inch thick. The smokebox is 71 inches long. The boiler carries a working pressure of 175 pounds. It contains 258 wrought iron tubes 1⅞ inches in diameter inside, and 11.4 feet long. The exhaust nozzle opening is 5¼ inches, and the smallest diameter of the smokestack 13½ inches.

The general design of the engine is so clearly shown in the drawings that a further detailed description is unnecessary. Some further information in regard to particulars not previously mentioned is given in the following table. The engine truck is equipped with the American engine truck brake:

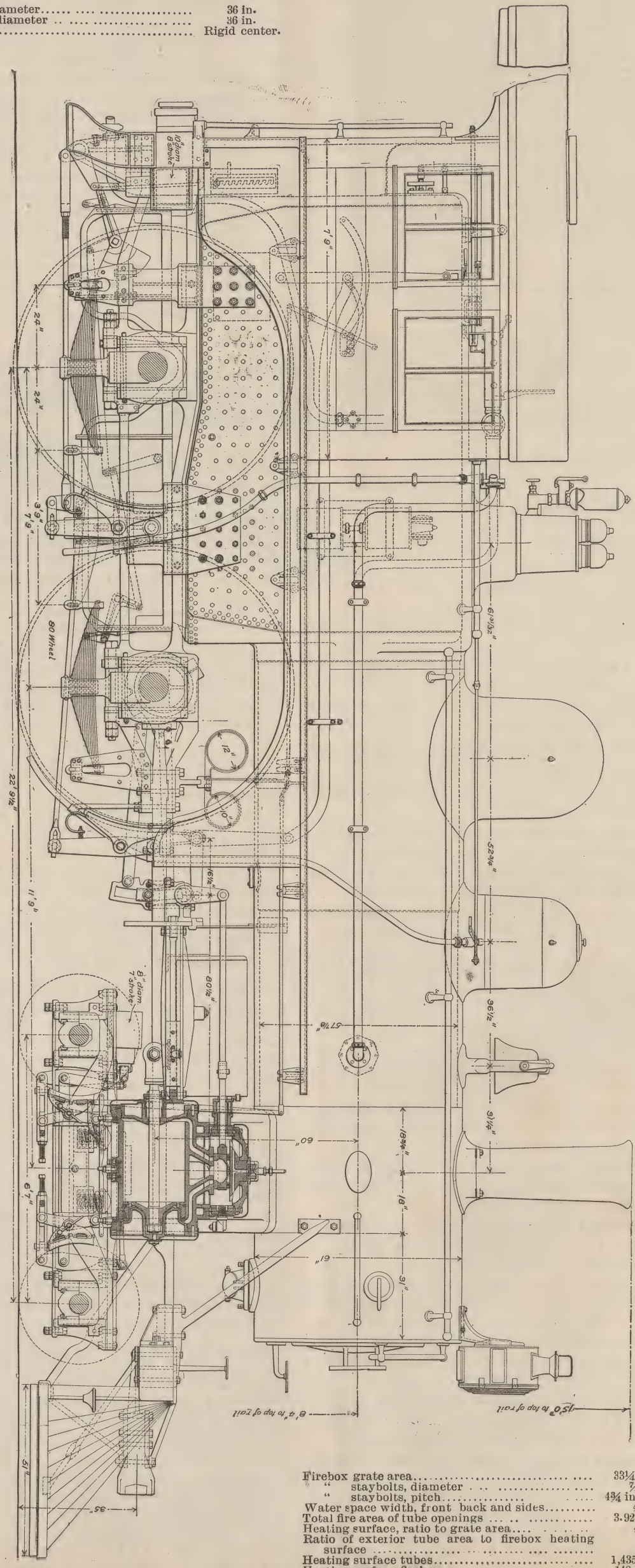
Truck wheels, diameter	36 in.
Tender wheels, diameter	36 in.
Engine truck	Rigid center.
Journals, driving axles	8½×10½ in.
" truck "	5½×10 in.
" tender "	4×8 in.
Distance, center to center of cylinders	6ft. 5 in.
Piston rod, diameter	3 in.
Form of crosshead and guides	Three bar guides.
Valve gear, type	Shifting link.
Ports, length	20 in.
" width, steam	1¼ in.
" " exhaust	3 in.
Firebox, type	Belpaire.
" length inside	9 ft. 11¾ in.
" width inside	3 ft. 4 in.
" depth at front	5 ft. ⅛ in.
" " " back	3 ft. 10⅛ in.



Half Sectional View through Firebox and Cab.



Half Section through Guides, Smokebox and Cylinder.



Firebox grate area	33¼ sq. ft.
" staybolts, diameter	⅞ in.
" staybolts, pitch	4¾ in. ap'r'x.
Water space width, front back and sides	4 in.
Total fire area of tube openings	3.92 sq. ft.
Heating surface, ratio to grate area	47.6
Ratio of exterior tube area to firebox heating surface	9.7
Heating surface tubes	1,435 sq. ft.
Heating surface firebox	148 sq. ft.
Heating surface total	1,583 sq. ft.

Master Car Builders' Association Circulars.

Coal Car Sides.

The following circulars have been issued by the Secretary of the Master Car Builders' Association:

To the Members of the M. C. B. Association:

Your Committee requests a blue print of your latest design of coal car body, showing in detail the method of bracing the sides, and replies to the following questions:

1. How many cars with sides of this design have you?
2. When were the first of your cars with sides of this design placed in service?
3. What weaknesses, if any, have these sides developed in service?
4. At the present time, do you know of any other design of sides that you consider superior to this one? If so, please send print of it, if possible.

Any further information that you may be able to give on the subject will be appreciated by the Committee. If you have no cars of this class and no information to offer, please reply to that effect. Please address your reply and send blue print to the Chairman, Broad Street Station, Philadelphia, Pa.

R. E. MARSHALL, *Chairman.*

R. P. C. SANDERSON, R. C. BLACKALL, R. MCKENNA, SAM'L HIGGINS, LA MOTT AMES, G. W. WEST, *Committee.*

PHILADELPHIA, PA., February 7, 1895.

Action of The American Railway Association on M. C. B. Standards.

The Secretary is advised by letter from Mr. W. F. Allen, Secretary of the American Railway Association, under date of Jan. 17, 1895, as follows:

"At a meeting of the American Railway Association, held on Oct. 17, 1894, the following resolution was adopted:

"Resolved, That the 'Details of Car Construction,' adopted by the Master Car Builders' Association, as published with the proceedings of its convention, held at Saratoga in June, 1894, be, and are hereby, adopted as standard by the American Railway Association, and all railway companies and car builders are recommended to conform thereto as soon as practicable."

In accordance with the instruction of the Association last June, the Executive Committee took up the question of standards with the American Railway Association, and the result has been as above.

Members are urged to consider the importance of following this matter up and taking up the standards of the Association with the proper officers of their respective companies and advocate their general adoption.

The Western Railroad Club.

The February meeting of this club was held on the 19th at the Auditorium Hotel, Chicago. The first discussion was on English railway practice, which was based on the paper read at the January meeting on this topic by Mr. F. A. Delano, Superintendent of Freight Terminals of the C., B. & Q. R. R. This was followed by a discussion on stationary boiler practice, which was opened by Mr. C. M. Higginson, Assistant to the Second Vice-President of the C. B. & Q. R. R. A committee reported on the revision of interchange rules, and a paper was read by Mr. George Gibbs, of the C., M. & St. P. Ry., entitled "Notes on Modern Practice in Signaling."

The Southern and Southwestern Railway Club.

The next meeting of this club will take place at the Kimbale House, Atlanta, Ga., on April 18, at 10 o'clock a. m. The subjects for discussion will be:

"Revision of Master Car Builders' Rules of Interchange."

"What is the Cause of Uneven Wear of Driving Wheel Tires Running in the Southwestern Territory?" Messrs. Wm. Rutherford, P. H. Schrieber, W. H. Hudson, committee.

"What is the Most Economical Method of Obtaining Compressed Air for General Use in Railroad Shops and its Application?" Messrs. T. W. Gentry, John S. Cook, W. F. Brodnax W. J. Hartman, committee.

Discussion of the report on Counterbalancing of Driving Wheels.

Additional report of committee on draft sheets, and discussion of the subject.

"What is the Most Economical Tonnage Spring: The Elliptic, Half Elliptic or the Coil, Considering the First Cost and the Duration and Efficiency of Each and Its Effect on the Rolling Stock and Track?" Messrs. R. P. C. Sanderson, Geo. W. Morris, S. A. Charpiot, committee.

Annual Meeting of General Passenger Agents.

The American Association of General Passenger and Ticket Agents will hold its 40th annual meeting at the Murray Hill Hotel, New York, at 11 a. m., March 19. Mr. Geo. H. Daniel, General Passenger Agent of the New York Central & Hudson River Railroad, will deliver the annual address.

The resolutions presented by the Accounting Officers' Association at the last meeting, which have for their object the co-operation of this Association with theirs, in the use of terms to be used as applied to the various kinds of tickets now in use, was by proper action made a subject for consideration at this meeting.

Work has been started at Somerville, N. J., on what will be, or what is intended to be, the longest trolley road in the world, that of the New York and Philadelphia Traction Company's proposed electric railway between these two cities.

Master Mechanics' Association Circulars.

The Stevens Institute Scholarships.

The President of the Master Mechanics' Association has issued the following circulars:

To Members of the Association:

The members of the American Railway Master Mechanics' Association are not enjoying the full benefits of the scholarships purchased in the Stevens Institute of Technology.

The Association expended a large sum of money on these scholarships, and it was confidently expected that there would be warm rivalry among those entitled to compete for entry to the institution; but up to the present time there has not been the full complement of students. At present, there are only three students, and one of them will graduate this Summer, leaving two vacancies to be filled.

There is an excellent preparatory school in connection with the Stevens Institute, which the Trustees have thrown open to those entitled to the benefits of our scholarships. If a candidate for the Institute does not think himself competent to pass the entering examination of the Institute, he may take a year at the preparatory school, if the full complement of scholars is not already in the Institute.

Sons of all members of the Association in good standing are entitled to compete for an entry to enjoy the benefits of the scholarships in the Stevens Institute of Technology. But it is necessary that the candidate should have spent at least one year working in a machine shop.

The next examination for candidates will be held at the Stevens Institute of Technology, Hoboken, N. J., June 7th to 13th. There will be another examination from September 16th to 20th.

The engineering education imparted to students of the Stevens Institute is of such a high character that graduates are eagerly sought after by engineering and manufacturing establishments. The education assures a student the best prospects for rapid advancement in the engineering profession. A father cannot provide his son with better prospects for success in life than by giving him the means of obtaining the education imparted by the four years' course in the Stevens Institute of Technology.

Members who wish to enter their sons for the Institute can obtain full particulars by applying to Angus Sinclair, Secretary, 256 Broadway, New York.

WM. GARSTANG, President.

Standard Sizes of Pamphlets, Catalogues, Letter-Paper, Etc.

Mr. G. W. Rhodes has been appointed Chairman and Messrs: Allen Cooke and E. M. Herr members, of a committee to report at next Convention on the adoption of standards for pamphlets, catalogues, letter-paper, etc.

WM. GARSTANG, President.

Axle and Tire Failures on British Railroads.

The British Board of Trade reports the following breakages of axles and tires on the railways of Great Britain during the nine months, ending Sept. 30 last:

Of the 142 axles which failed, 92 were engine axles, 75 driving and 17 leading or trailing; 13 were tender axles, 1 was a coach axle, and 36 were freight-car axles. Of the 75 driving axles, 23 were made of iron and 52 of steel. The average mileage of 22 driving axles made of iron was 264,274 miles, and 50 driving axles made of steel 260,384 miles.

Of the 308 tires which failed 15 were engine tires, seven were tender tires, two were coach tires, 15 were van tires and 269 were wagon tires. Of the wagons, 233 belonged to owners other than the railway companies; 224 tires were made of iron, 83 of steel, and in one case the material was not stated; three of the tires were fastened to the wheel by Gibson's method, four by Mansell's method, one by Beattie's method, 265 by bolts or rivets, two of which left their wheels when they failed; 35 by other methods, two of which left their wheels when they failed; 27 tires broke at rivet holes, 75 in the solid, and 205 split longitudinally or bulged.

Rear Collisions on the Grand Trunk.

Two rear collisions of passenger trains occurred on the Grand Trunk Railroad in Canada early in February. The Grand Trunk express train from Montreal to Boston and New York was detained by a stalled freight train near St. Johns, N. B., Feb. 6. A following local train crashed into it and severely injured a number of passengers.

Another disaster occurred on this line Feb. 8. A passenger train was run into near Weston, Ont., by a following train, and the rear car, a Pullman sleeper, was wrecked, seriously injuring four men. This and the preceding car immediately took fire and were consumed.

The Kentucky law requiring negroes to ride in coaches separate from those occupied by white people on railroad trains in that State was declared unconstitutional by a decision in a test case in the United States Circuit Court at Owensboro, Feb. 4. An appeal was taken by the Louisville & Nashville Railroad Company (against whom the decision was rendered) to the United States Supreme Court.

A well-known colored railroad conductor is Henry Vanness, who has for seventeen years been a conductor on the Rockville (Conn.) branch of the New Yoak & New England Railroad. He is popular with both railroad officials and patrons, has been offered runs on the main line, and wears a gold medal presented to him in 1880 by the people who travel on his trains. He has saved considerable money, and talks of retiring from the road and going on a farm.

Axle Specifications, Baltimore & Ohio Railroad.

Through the courtesy of Mr. George B. Hazelhurst, General Superintendent of Motive Power of the Baltimore & Ohio Railroad, we are enabled to present herewith the specifications under which all axles are purchased for the rolling-stock of the road. Steel is used exclusively for axles on the Baltimore & Ohio, and gives good general satisfaction.

Specifications for Steel Driving Axles.

All driving axles must be rough turned throughout. They must be deeply and accurately centered with 60-degree centers, and cut to exact lengths. The journals of all driving axles must be swaged.

As many axles as possible must be made from one heat, the heat number being stamped on the end of each axle.

All axles must be "worked up" to the satisfaction of the inspector. One axle from each heat will be drawn to six inches extra length, and from this two test specimens will be cut longitudinally—the center line of the test specimens being at least one and one-half inches from the center line of the axle.

These test specimens should be 2½ inches between shoulders, and one-half inch in diameter. They should have an ultimate tensile strength of 80,000 pounds per square inch, and an elongation of 20 per cent. All axles made from this heat will be rejected should the ultimate tensile strength be less than 75,000 pounds per square inch, or the elongation less than 15 per cent.

All axles will be carefully inspected, and those showing cracks, flaws, seams, or other defects, will be rejected.

Axles developing defects in working will be returned at the expense of the manufacturer.

Specifications for Steel, Passenger Car, Freight Car, Locomotive Tender and Truck Axles.

All axles are to be centered with 60-degree centers, have forged journals, and be rough turned on journals and wheel seats only.

All axles must be stamped with the word "Steel" near the center of the axle; also with the heat number from which the axles are made.

As many axles as possible must be furnished from one heat (preferably 50 or more, and never less than 20), and from every heat represented one axle will be taken at random and subjected to the drop-test described in the following paragraph. If this axle stands the prescribed test, the axles from that heat will be carefully inspected, and only those will be accepted which are made in a workmanlike manner, and are free from cracks and unwelded seams.

Drop-Test.—Axles 4¼ inches diameter at center must stand five blows of a 1,640-pound weight falling 23 feet, striking midway between firm supports 3 feet apart; axle to be turned after each blow. For axles over 4¼ inches diameter at center, 2 feet will be added to height of drop for every ⅛-inch increase of diameter at center.

Manufacturers are required to notify the General Superintendent of Motive Power six days before the material is ready for inspection, and they must furnish free of charge test axles and suitable testing machines and assistance to enable inspector to make prompt and satisfoctory examination and test.

Yellow Pine in Car Building.

The *Timberman* says that $13.50 has been a common price for yellow pine car siding recently, as against $27 as the lowest figure on white pine; but these prices are of but little question as to preference, though there are some objections to yellow pine for this purpose, but they are nominal rather than real. One is that under the trying conditions of freight car service, and owing to the exposure to the suns of summer, the pitch will sometimes exude from the yellow pine siding; but it is said that by painting the cars a dark brown the working out of the pitch does not injure their appearance as it would in some other colors, and this is really about the only objection to the material.

Another advantage claimed for the use of yellow pine car siding is that it greatly strengthens the car, stiffening it materially, so that its weight is more than compensated for by increased strength. However, the railroad companies and car builders are showing themselves disposed to try any material that is offered for car building with promise of economy and usefulness.

The Wages Question on the Southern Railway.

The employees of the Southern Railway petitioned the officers of the company for a general increase of pay some time ago. In declining the request, which was done at a meeting of the officers and employees on Feb. 13, a pamphlet was issued to the men giving a thorough and exhaustive analysis of the commercial and industrial conditions in the South affecting the question of wages and the relative position of railroad employees as compared with those engaged in other industries, and giving the reasons why the company is unable to make general increases at present. The pamphlet explains that inequalities of pay and service exist in consequence of the previous separate control and management of the several parts of the system, and these are to be equalized. The changes made on this account are increases in every case and apply chiefly to employees receiving the small pay of $65 a month, those receiving less than that amount on the East Tennessee, Virginia & Georgia lines having had their wages reduced more than those on the Richmond & Danville. This inequality is corrected by the new schedule.

Twelve-Wheel Freight Locomotive, Central Pacific Railroad.

The engraving on this page reproduces a photograph furnished us by the Schenectady Locomotive Works, and shows the general construction and appearance of a 12-wheel freight engine recently built for the Central Pacific and just delivered to that road. It is intended for service on the Mountain division and its chief work will be in climbing the heights of the Sierra Nevada Mountains. It is designed to burn bituminous coal, and for 4 feet 8½-inch gage of road. It weighs 173,500 lbs. in working order, 146,500 pounds resting on the drivers. The driving and rigid wheel base is 15 feet 6 inches, and the total wheel base is 25 feet 4 inches. The cylinders are 22 inches × 26 inches. The piston is 5½ inches thick and is packed with cast iron rings, Jerome metallic packing being used in the piston rod stuffing boxes. The piston rods are 4 in. in diameter, Jerome metallic packing is also used in the valve-stem stuffing boxes. The valves are the American balanced and have a travel of 5½ inches.

The driving wheels are 51 inches in diameter outside of tire, and the tires are secured by shrinkage. The driving axle journals are 8½ inches in diameter and 9 inches long. The engine truck wheels have cast iron spoke centers and are steel tired and 24 inches in diameter. Shrinkage secures the tires. The journals of the engine truck axles are 5 inches in diameter and 9 inches long.

The boiler is straight, 72 inches in diameter, and carries a working pressure of 180 pounds per square inch. It is made of steel plates, and the horizontal seams are butt-jointed, sextuple riveted, and have welt strips inside and outside. The circumferential seams are double riveted. The firebox is 120⅛ inches long and 41⅝ inches wide. It is 66½ inches deep in front and 63 inches deep at the back. The firebox sheets are made of Shoneberger steel. The boiler contains 274 charcoal-iron tubes 2¼ inches in diameter and 13 feet 6 inches long.

The tender weighs 35,560 pounds empty and is carried on two four-wheel trucks with 33-inch Canda chilled plate wheels. These have journals 4¼ inches by 8 inches. The wheel base of the tender is 14 feet 11 inches. The tender frame and trucks are the Southern Pacific Company's standard. The tender carries 4,000 gallons of water and 21 tons of coal. It will be noticed that extra provision is made to carry the coal without allowing any to spill off while running.

The total wheel base of the engine and tender is 52 feet 9 inches, and the total length is 59 feet 6⅛ inches. The engine is fitted with the Westinghouse-American combined air brake on all drivers, and on the tender and for the train. Also, with Leach's sand feeding apparatus, the Sweeney brake arrangement and the Le Chatelier water brake.

The following table gives further information of the construction of this mountain giant:

Size of steam ports	18 in. long × 1¼ in. wide.
" exhaust ports	18 " " × 3 " "
" bridges	1¼ in. wide.
Inside lap of slide valves	3/32 "
Lead of slide valves in full stroke	1/16 "
Diam. and length of main crank pin (main rod)	6 in. diam. × 6 in. long.
Diam. and length of main crank pin (side rod)	6½ " " × 5¼ " "
Diam. and length of intermediate crank pin	5½ " " × 4½ " "
Diam. and length of F. & B. crank pin	5 " " × 3¾ " "
Firebox, thickness crown sheet	⅜ in.
" " tube "	5/16 "
Firebox, thickness side and back sheets	5/16 "
Firebox, water space, front	4 "
Firebox, water space, sides and back	3½ "
Firebox, crown staying	7 in. × ⅞ in. bars, welded at ends
" stay bolts	⅞ in. and 1 in. diam.
Heating surface, tubes	2,161.7 sq. ft.
" " firebox	184.9 "
" " total	2,346.6 "
Grate "	34.5 "
" style	Rocking, finger bars.
Ashpan, "	Sectional.
Exhaust pipe	Single, high.
" nozzles	5¼ in., 5½ in., 5¾ in.
Throttle	Balanced valves, double poppet
Smokestack, I D	16 in.
" top above rail	14 ft. 8½ in.

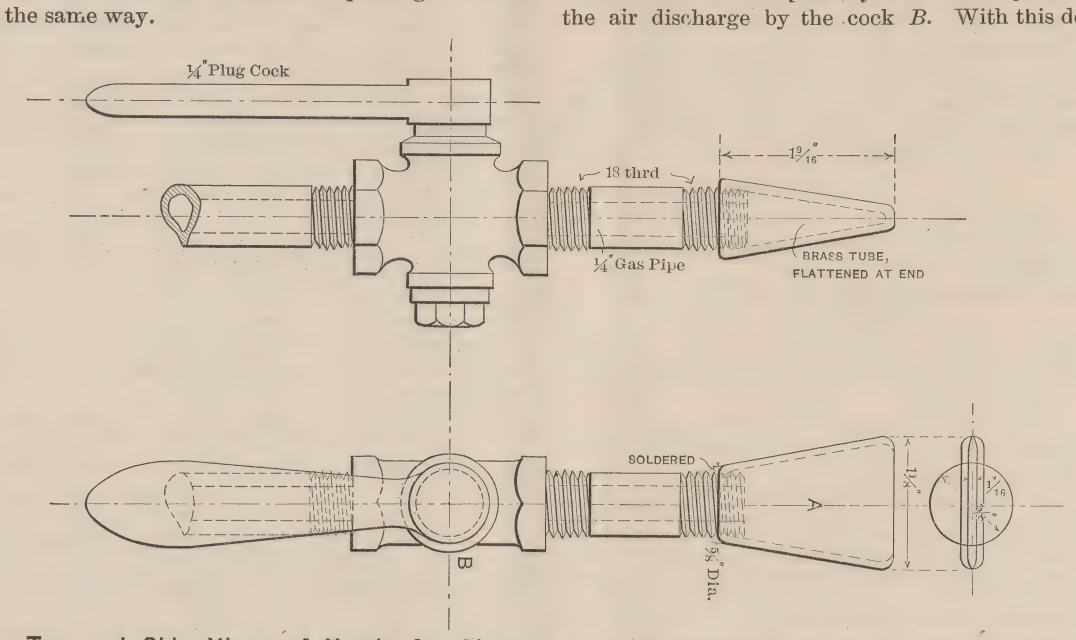
Boiler supplied with two No. 10 Nathan & Co.'s monitor injectors

A Santa Fe passenger train was robbed by two armed men at Sylvia, Kan., Feb. 4. The engine took coal at this town, and before it left the chutes it was boarded by the robbers, who relieved the engineer and the fireman of what money they had, and then treated the passengers in the coaches the same way.

The *Express Gazette* has been keeping track of train robberies during the last five years, and reports that the number of passenger trains "held up" in 1890 was 12, in 1891 and 1892 the number was 16 in each year. It was 33 in 1893, and 27 in 1894. A total of 104 robberies, in which 27 people were killed and 27 injured.

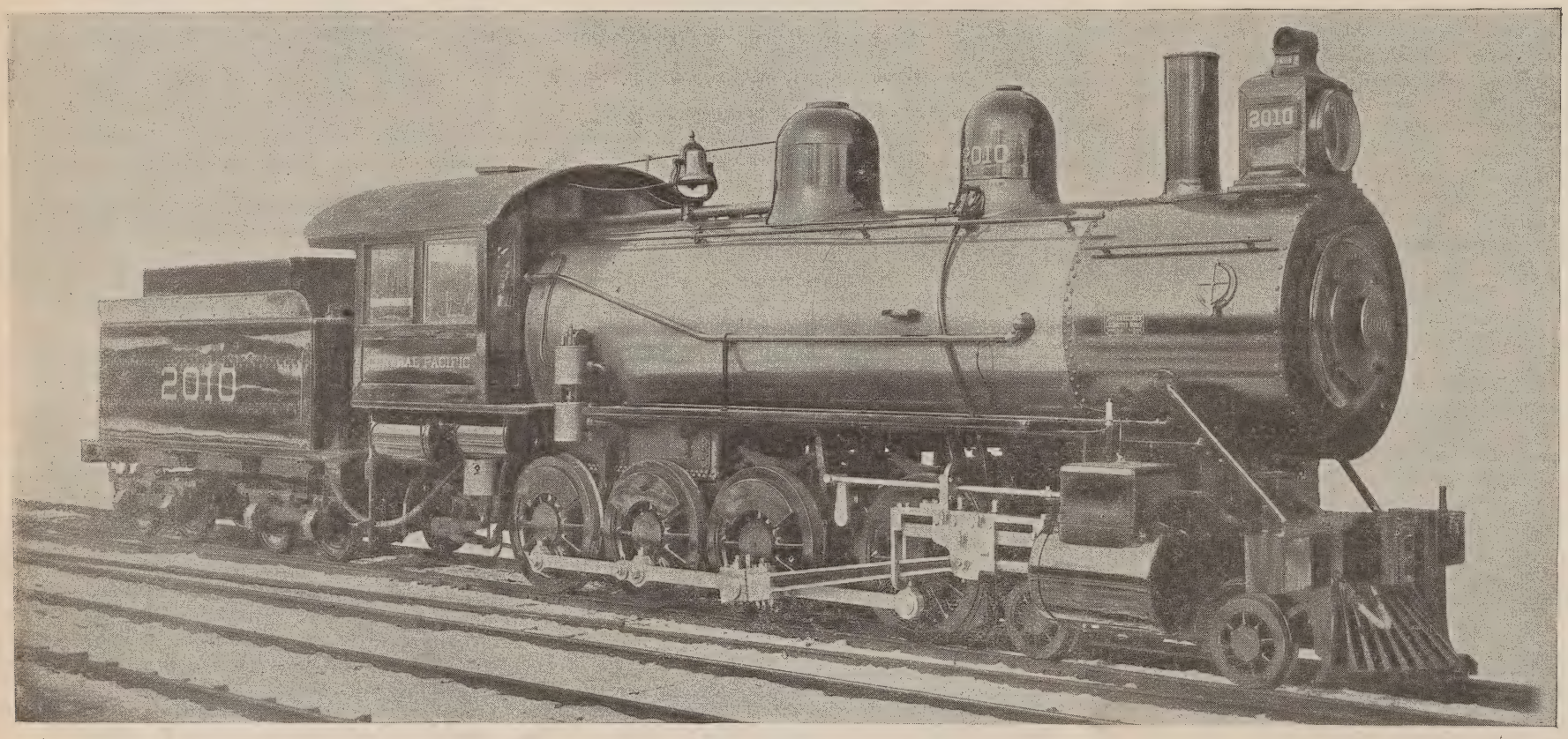
Pneumatic Device for Cleaning Cars and Seat Cushions.

The following illustration shows a nozzle for cleaning the cushions of car seats, and for cleaning the interiors of the cars of dust, cinders, etc., used at the Omaha car shops of the Union Pacific Railway, and which we are able to present by the kindness of Mr. J. H. McConnell, Superintendent of Motive Power and Machinery of the road. When a pressure of air is forced through a hose with this nozzle attached it searches out every particle of accumulated dust and most expeditiously removes it. The nozzle *A* is made from a piece of brass tubing, flattened and drawn down as shown. Air is supplied by suitable hose connections from stations about the shops and yards. The operator governs the air discharge by the cock *B*. With this device seat cushions are thoroughly cleaned from dust in from 30 to 40 seconds, and no beating is necessary.



Top and Side Views of Nozzle for Cleaning Cars, Cushions, Etc., by Compressed Air.

The government of Chili has announced its intention of purchasing all the railroads in the country.



Freight Locomotive for Mountain Service, Central Pacific Railroad.

Exports of American Rolling Stock in 1894.

During 1894 American car manufacturers exported 1,723 freight and passenger cars, valued at $1,700,521; 11,639 car wheels, valued at $94,954, and 142 locomotives, valued at $1,028,336. The following table shows the number of American-built cars and locomotives sent to the various countries of the world:

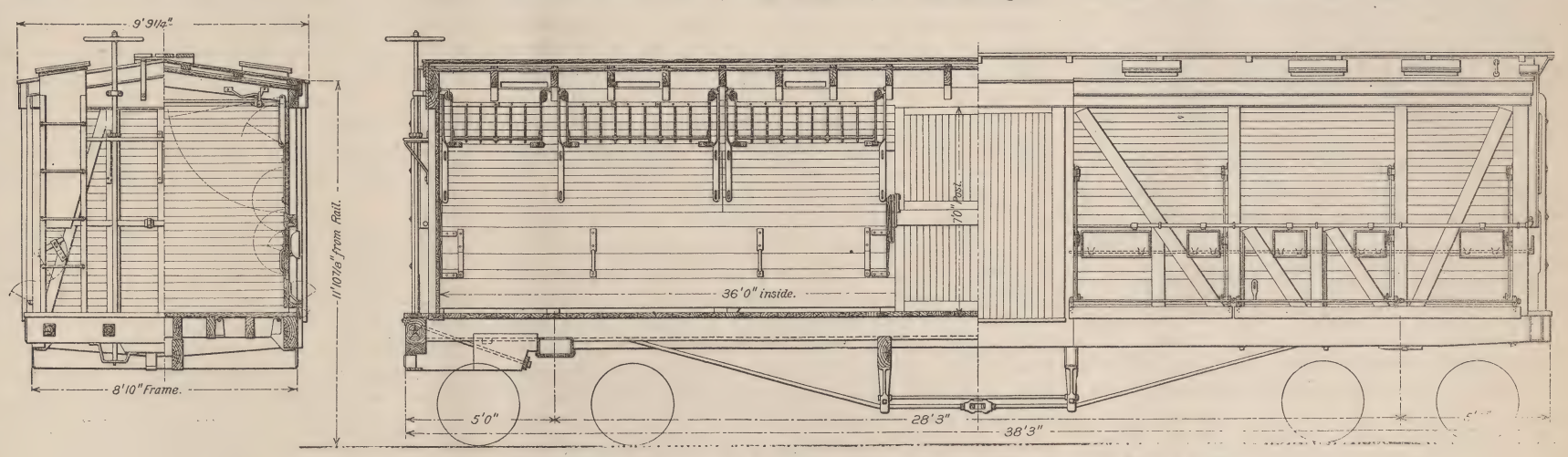
Name of country.	Cars.	Locomotives.
Belgium	6	....
Italy	18	1
Honduras	....	1
England	1	....
Quebec, Ontario, etc	9	14
Guatemala	58	2
Salvador	16	...
Mexico	82	6
British West Indies	34	3
Santo Domingo	4	3
Cuba	696	33
Porto Rico	....	1
Argentine Republic	5	4
Brazil	681	26
Chile	....	24
Colombia	89	3
Peru	2	1
Venezuela	22	5
Japan	....	15
Total	1,723	142

Some Extremes of Temperature.

The St. Louis *Globe-Democrat* says the lowest temperature ever recorded on the earth was taken at Werchojansk, in the interior of Siberia, Jan. 15, 1885. It was 90 degrees and a fraction below zero. Werchojansk is in the latitude of the pole of cold. There the earth is frozen to a depth of about 100 feet, and in the warmest season it never thaws. The highest temperature recorded is 124 degrees and a fraction, taken in Algeria July 17, 1879. The lowest temperature on record in the United States is 64 degrees below zero, at Tobacco Garden, North Dakota. Greely, the Arctic explorer, has probably experienced a wider range of temperature than any other living man. He recorded 66 degrees below zero at Fort Conger, in Lady Franklin Bay. On another occasion, in the Maricopa Desert of Arizona, his thermometer in the shade ran up to 114 above. A lucifer match dropped upon the burning sands of the Sahara will catch fire. It is very difficult even with the finest thermometers to get accurate records of extreme temperatures, and on that account such observations in general are to be regarded as only approximately correct.

A Combination Stock, Box and Coal Car, Baltimore & Ohio Railroad.

We are indebted to the courtesy of Mr. E. W. Grieves, Superintendent of the Car Department of the Baltimore & Ohio Railroad, for the following description and illustrations of a most ingeniously arranged stock car, that, while perfectly arranged for the requirements of live stock traffic, can yet be easily changed into an open-sided car, for the transportation of coal, or a tight-sided car for such uses as box cars are most suitable for.



General Arrangement of the Campbell & House Combination Stock and Freight Car.

The car is known as the Campbell and House combination car, and was designed in accordance with the suggestions of Mr. Robert B. Campbell, General Manager of the road. A number of these cars have been built, and are in successful operation. The main object of their construction is to provide cars that can always carry a useful and paying load in which ever direction they run. The live stock traffic of the Baltimore & Ohio is very considerable, but it is nearly all an eastbound traffic. During the return trip to the West the cars are generally hauled empty, as they are unfitted for most kinds of westbound freight. Of course this haul is a dead loss, and it is to avoid such loss that this combination car has been designed. It can carry the eastbound live stock traffic most admirably, and it can carry all kinds of westbound traffic as well, whether it consists of merchandise, coal or coke, lumber, long or short, rails or grain. The advantages of such a car are so obvious that comment is unnecessary.

The line engraving on this page reproduces the general arrangement drawing of the car showing the arrangement when in the position for stock traffic.

The mechanical construction of the car is such that it can be readily changed into the different classes of car, and is so constructed that it is strong and durable when used for any class of freight, and it is not an expensive car to keep in repair.

Arranged as a stock car, it is equipped with first class hay feed racks, with the necessary openings above through which the hay is put into the racks; it has complete and ample water troughs along each side into which water is run from tanks placed at the end of the car. These tanks are so placed at each corner of the car that they can be filled from any position of the spout or hose from either side of the track. The troughs can also be used as grain feed boxes when the occupants of the car are horses. The car is, in fact, equipped with all necessary facilities for the convenient and humane transportation of live stock; and one of our illustrations shows an interior view of the car when arranged for this purpose.

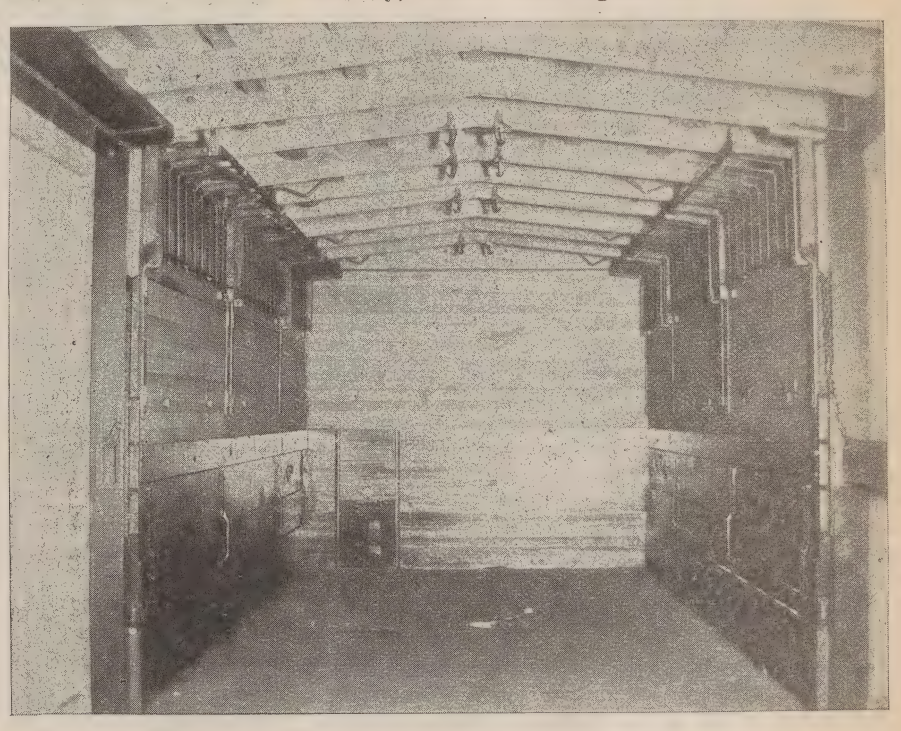
When desired to be used as a coal or coke car, this car is so arranged that by shifting a portion of the slatted sides from their position, the lower one-third of the side of the car (exclusive of the door) becomes tight instead of slatted, and the middle one-third becomes open, through which open portion coal can be loaded and unloaded, instead of such work being done entirely through the doors, as is done when shipping coal in the ordinary box car. This arrangement, as will be clearly seen, largely reduces the time and cost of handling coal and coke in the loading and unloading. When thus arranged the feed racks are shoved up against the roof, and the water troughs are folded into the side walls of the car.

When the car is to be arranged for use as a box or merchandise car, it is easily transformed into a tight sided car by appropriate side doors swinging down from the roof, which are so arranged as to exactly fill the open middle one-third, thereby making a weather-proof box car. These doors have been so developed that the adjustable parts are easily and simply operated and are entirely devoid of complication or weak construction. Its value as an emigrant moveable car (in which trade at present ordinary box cars are used) will be readily seen. One end of the car can be made tight for the reception of the household goods, while the other end can be arranged as a stock car for the stock. In stormy weather one side can be entirely closed and the other left open if desired. Its value as a merchandise and grain car is equally apparent, as it can be tightly closed, so that a large majority of the commodities now carried in box cars can be hauled in this car, or it nca be used for coarse grain by putting a bottom on the floor. Appropriate end doors provide for the loading and unloading of steel rails, long timber or lumber, which cannot be loaded through the side doors. These cars are equipped with Fox pressed steel trucks, American continuous draw bar, Schoen pressed steel body bolster, Cleveland City Forge turn-buckles, National Hollow brake beams, Westinghouse air brake and air signal, and Buckeye automatic couplers.

Exterior View, Arranged for Live Stock.

Exterior View, Arranged for Coal or Coke

Interior View, Arranged for Live Stock.



Interior View, Arranged for Grain or Merchandise.

The temperature of the bottom of the Atlantic Ocean, as determined by the resistance of the Atlantic cable, is said to be 38 degrees Fah., which is a mean for the whole year. That at the bottom of the Mediterranean, measured in the same way, is said to be 57 degrees Fah.

The Los Angeles *Times* says: "Los Angeles is the rail road center of the Coast. Four railroad systems, including 6 lines, center here. Two of these are transcontinental systems, while San Francisco has only one. Moreover, all the new roads looking toward California have their eyes in this direction. 'All roads lead'—not to Rome, but to Los Angeles."

Petroleum for Locomotive Fuel.

The superior advantages of petroleum for locomotive fuel, compared with those of coal for the same purpose, depend almost entirely on the locality and the respective cost of the two fuels. Locality has everything to do with regulating the price of these commodities. At and near the places where they are obtained they are cheap, but when either has to be transported over long distances the added cost of transportation sometimes becomes excessive. Thus, some of the railroads that run through the bituminous coal fields of the Middle States get their coal for a dollar a ton, while some of the roads on the Pacific coast pay about $5 per ton, as the Southern Pacific does, and about $9 per ton as the Southern California does. A year ago the Chicago, Burlington & Quincy road made some practical experiments with petroleum as fuel, and it was then learned that practically one pound of oil used as a fuel was equivalent to two pounds of coal, and that with oil costing 1.7 cents per gallon it was equal in cost to coal at $2 per ton. According to these tests oil at this price is the cheapest fuel where coal costs $2 or more per ton, and it is the dearest where coal costs less than $2 per ton. This was a practical test, and as the mechanical officers of the Chicago, Burlington & Quincy are generally quite thorough in their investigations it may be taken for granted that these figures represent the actual state of the case in this country at present, and until we get some equally reliable data from other sources.

Renewed interest has been awakened in this matter recently by the action of the Southern California Railway in substituting petroleum for coal fuel on some of its freight and passenger engines. Mr. K. H. Wade, the General Manager of the road, has been industriously studying this problem for several years, and with the assistance of his Superintendent of Motive Power, Mr. George W. Prescott, and Mr. William Booth, has recently been experimenting considerably with the view of obtaining the safest and most efficient arrangement for carrying and burning petroleum on locomotives. Mr. Booth was formerly Master Mechanic of the Peruvian Central Railway, where he had some experience with liquid fuel. This experience has probably proved of value in the recent experiments. Anyway, the first information we receive of the successful use of petroleum on the Southern California comes in the shape of a newspaper article sent us by Mr. Wade, saying that the arrangement for carrying and burning the oil is the patented invention of Mr. Booth. This article says that the equipment makes very little change in exterior appearances, the tank being so arranged that the locomotive is neat, compact and safe. The oil tank holds a little over five tons of oil and is firmly located inside the water tank —that is, the water surrounds the oil reservoir. There is 6 feet of water on the back end of the tank, 18 inches on the sides and front and 6 inches on top. It is provided with an oil-tight manhole and has a gas vent, so that any amount of shaking about or even upsetting will not cause the oil to escape. Provisions for safety from fire or explosion are still further secured by two automatic safety valves, one on the top and the other on the bottom of the tank. In case of accident breaking loose the tank from the engine, a rope on the top valve and a chain on the bottom one shut the safety valves and cut off the flow of oil instantly, keeping it confined to the inside tank. Two burners are used with two steam jet atomizers, and the fireman controls the whole apparatus by handles within easy grasp.

As coal must be brought in from the outside and paid for at the high price mentioned above, it is very easy to understand that the efforts to substitute petroleum will probably prove successful and entirely satisfactory on the Southern California road, especially when it is known that petroleum exists in the adjacent country, and, in fact, in the heart of Los Angeles. During the last year the development of the petroleum industry in Southern California has become very active. This may be understood when it is said that three years ago the output of petroleum in this territory was only 1,000 barrels per annnm, and two years ago only 1,300 barrels. The output has now increased to about 40,000 barrels per moth, or about 500,000 per annum, and conservative people on the ground express the opinion that a beginning has only been made, as vast tracts of available oil land yet remain untouched.

Passing from the West to the East we find unprecedented attention being given to the production of petroleum. In Ohio over 3,000 oil wells have been drilled during the past year, one of these producing over 1,200 barrels per day, while another produces an average of 7,440 barrels per day. One of the stock arguments against the use of petroleum for locomotive fuel has been that the supply would immediately fall short of the demand, and that consequently the price would go "out of sight." It is evident from the foregoing that there is not much danger of this, but that if there was more demand for petroleum its production would be so stimulated that competition would probably reduce its cost.

Probably the Great Eastern Railway, of England, has the most perfect arrangements in use for burning oil in its locomotives, and the following letter from Mr. James Holden, the Locomotive, Carriage and Wagon Superintendent of the road, is so pertinent that we publish it herewith in full. It was written by Mr. Holden in reply to our inquiry as to his practice and experience with oil fuel:

Editor National Car and Locomotive Builder:

We have at present 25 locomotives in regular service on this railway and 10 stationary boilers and furnaces at our Stratford works fitted with the apparatus. The fuel we use is a mixture of oil gas tar, coal gas tar, creosote oils and petroleum residues, one ton of liquid fuel approximating in practice to two tons of steam coal in calorific value. For this system of burning oil fuel I claim the advantage of an engine equally available for coal firing as with oil. The engine may be worked chiefly with a coal fire, and the oil apparatus used in conjunction should an exceptionald emand for steam arise or a smokeless fire be required for a time, as when entering city limits, etc. The oil fuel may be used almost entirely by reducing the coal fire to a minimum (just sufficient to cover the bars) and closing the dampers, as we use it on this railway. When standing, the oil fire can be instantly checked or stopped without fear of starting leakages by the sudden contrac. tion which would ensue if no incandescent base remained to graduate the reduction in temperature Each injector has two steam supplies, one to an internal annular jet, which injects the oil fuel in the form of finely atomized spray through the nozzle, and at the same time exhausts air through a central tube, either from the main automatic vacuum brake pipe or through a series of air-heating tubes placed round the interior of the smokebox. The second steam supply is delivered to a ring-blower arranged at the front of each injector, from which it escapes in small jets, inducing in regular quantity additional atmospheric air to ensure perfect combustion, and at the same time atomizing the stream of liquid fuel issuing from the nozzle; further, these jets distribute the gases over all parts of the firebox, and so equalize the flame, without the aid of firebrick erections common to other systems, and fatal to the alternate use of a coal fire.

The consumption of fuel on these engines compared with coal burners is as follows:

Month's Average of over 3,000 Miles Running.

Liquid fuel burning.	Lbs. per mile.	Coal burning.	Lbs. per mile.
Liquid fuel	10.5	Coal	35.4
Coal, inclusive of lighting up, etc	11.8		
Total	22.3		

One of these engines recently ran through from London (St. Pancras) to Scarborough and back with a train weighing 200 tons. The total distance run was 532 miles, and the time used 12 hours 50 minutes, including all stops. On the down journey 256 miles were covered in 6 hours and 15 minutes, including seven stops covering 25 minutes. The fuel consumed averaged 11.5 pounds of coal, including lighting up and standing all day, and 12.2 pounds of oil fuel, a total of 23.7 pounds per mile.

This performance I consider very satisfactory, as on such a trip two coal burning engines would certainly have had to be used, one to relieve the other halfway on account of the dirty condition of the fire.

As regards the use of crude petroleum as fuel and its dangers, we have used oil with flash points ranging from 50° Fahr. upward, including light inflammable hydro-carbons from oil gas works, and, although the Great Eastern Railway in the London district is a vary crowded line, we have never experienced the slightest danger, nor do we anticipate any. I invariably take the precaution of providing a fine wire gauze strainer or sieve at the filling hole, which, while filtering the oil effectually, prevents any flame from lights, etc., reaching the interior of the cylindrical store tanks. The tanks are self-contained and of ample strength to stand very rough usage. In order to prevent explosions of the gas remaining in empty or partially empty tanks when engines are laid off for repairs, it is our custom to fill the tanks up with water before bringing the engines into the shops.

James Holden.

Bad Wrecks on the Santa Fe.

Two bad wrecks occurred on the Atchison, Topeka & Santa Fe on the night of Feb. 16. Disobedience of train orders caused the first wreck and brought a stock train and an excursion train into collision, killing the engineer of the stock train instantly and fatally injuring the fireman of the passenger train. The engineer who was killed was responsible for the wreck. A brakeman was also fatally injured in this wreck. Eighteen persons were seriously injured and 70 head of cattle were killed. It is said that the loss to the company will exceed $50,000.

The second wreck occurred at a crossing of the Santa Fe and the Missouri Pacific tracks near Pittsburg, Kan. Eight passengers were seriously injured and every passenger on the Santa Fe train was hurt in some way.

Bill Cook. (this period is not a typographical error), the notorious outlaw and hero of numerous recent train robberies, was sentenced to 45 years in the Albany penitentary by the United States Circuit Court at Fort Smith, Ark., Feb. 12. This is why a period should always follow the name of Bill Cook.

The largest check ever drawn in this country, and possibly in the world, hangs in the office of the treasurer of the Pennsylvania Railroad in Philadelphia. It was drawn June 7, 1881, by the treasurer of the Pennsylvania Railroad Company for $14,949,052.20 in payment for the stock of the Philadelphia, Wilmington & Baltimore Railroad Company.

The Storage Battery.

In reference to the value and utility of storage batteries, Mr. Frank W. Hawley, vice-president of the Cataract General Electric Company, expresses his conviction as follows:

"Nothing is more needed in the electrical world to-day than a perfect storage battery. Of late our chemists and electricians have devoted much thought and experiment to this subject. Successive inventors have gradually improved former models, but the ideal battery has not yet been offered to the public. When we consider, however, that the percentage of loss between the quantity of energy stored and discharged is said to have been gradually reduced from 50 per cent. to 20 per cent., and possibly below that figure, we see that there is no reason for discouragement. Street car companies would gladly adopt any reliable storage battery, since that system would be far more convenient for their use in the crowded thoroughfares of cities, and would do away with the unsightly trolley.

"Electricity has become a portable commodity. Not only will it be flashed over miles of intervening space on cables following the great lines of commerce, but sealed in storage batteries it will eventually be delivered everywhere. In my opinion battery cars, having an enormous capacity, will be constructed, and charged either at generating stations in the coal districts, or at stations where the current is generated by water power. These could be sent to their destination just as oil tank cars now are, and their contents delivered to a local distributing station. In nearly every State of the Union there is soft coal of more or less value. Some is so poor that it would not pay to mine and transport it by land or water. But if a generating station should be located at these mines, the poor coal could be transformed into electric energy, stored in such cars as I have described, and shipped to sections where a direct current could not be sent. In the lumber districts of Michigan, also, it would be entirely practicable to erect portable generating stations, where refuse lumber could be consumed, giving power to operate the saws, and any surplus could be similarly transported elsewhere for light, heat and power purposes. These are some of the numerous uses that could be made of perfected storage batteries. In my opinion they will be so used in the near future."

Faster Train Speeds.

A member of the engineering department of the Pennsylvania Railroad, in speaking recently of increased average passenger train speeds, said: "If our railroads could spare the money to elevate their tracks in cities and at crossings, to say nothing of completing the work of straightening out curves, now going on, I, for one, will predict that we can make an average of fifty miles an hour between New York and Chicago. I say this with the Allegheny Mountains almost staring me in the face. We might lose time going up that range; but engineers, as a rule, like to coast, and wouldn't they slide down the other side with a roadbed minus curves and grade crossings! In the matter of cost in making improvements few people are aware of the expense attached thereto. In round numbers our road 'blew in' fully $5,000,000 in the latter part of 1892 and the beginning of 1893. That was before the financial depression set in. We are now resting on our oars. We cut out one curve over a mile long, and the work cost us fully half a million. Other roads have been doing likewise, and with the return of a prosperous period we will surprise the world, and especially the English, with the average speed our trains will attain."

The Heat of the Sun..

During a lecture delivered on this subject by Sir Robert Ball at Manchester, Jan. 23, he said that the heat of the sun was a hundred times greater than that of any furnace that could be devised by modern art; its size in proportion to that of the earth was as a cocoanut to a mustard seed. An important problem raised in recent times was as to the method or process by which the heat of the sun was continuously maintained. It was a mistake to suppose that the spots visible on the sun were permanent features. They were rather in the nature of holes or openings, over which floated those luminous clouds forming the outer layer of the sun, from which its light and heat came to us. This outer layer was in its nature like the rind of an orange, or, more closely, like that of a peach. The explanation of the sun's heat was mechanical. It was known to every practical man that a cooling body becomes smaller in size. Even the sun could not escape from the application of this law. The sun was becoming smaller every day. The diminution in size was at the rate of about 10 inches a day. In view of the sun's great size, however, it would be thousands of years before astronomers could notice the movement. In this shrinking of the sun was the mechanical explanation of the source and origin of its heat. The heat of the atoms of which the luminosity of the sun clouds was composed was in proportion to the speed at which they moved. By the contraction of the sun there was caused, through its great power of gravitation, a quick and accelerated inward movement of atoms. In this way, although always throwing off their heat, they were no less continuously gaining greater speed. Heat was thus maintained by a mechanical process.

Adding Larger Boilers to Old Locomotives.

The advantages of large boilers for locomotives have become pretty well appreciated by most railway mechanical officers, and during the last ten years rapid progress has been made in increasing the size of boilers to afford larger grate area and heating surface, and more capacity for water and steam. At the same time the boilers are generally improved in design and strengthened to withstand higher pressures. Numerous advantages follow. The engine is made more powerful, and economical in its use of fuel. Nearly all locomotives built previous to the present decade could with great advantage have larger boilers.

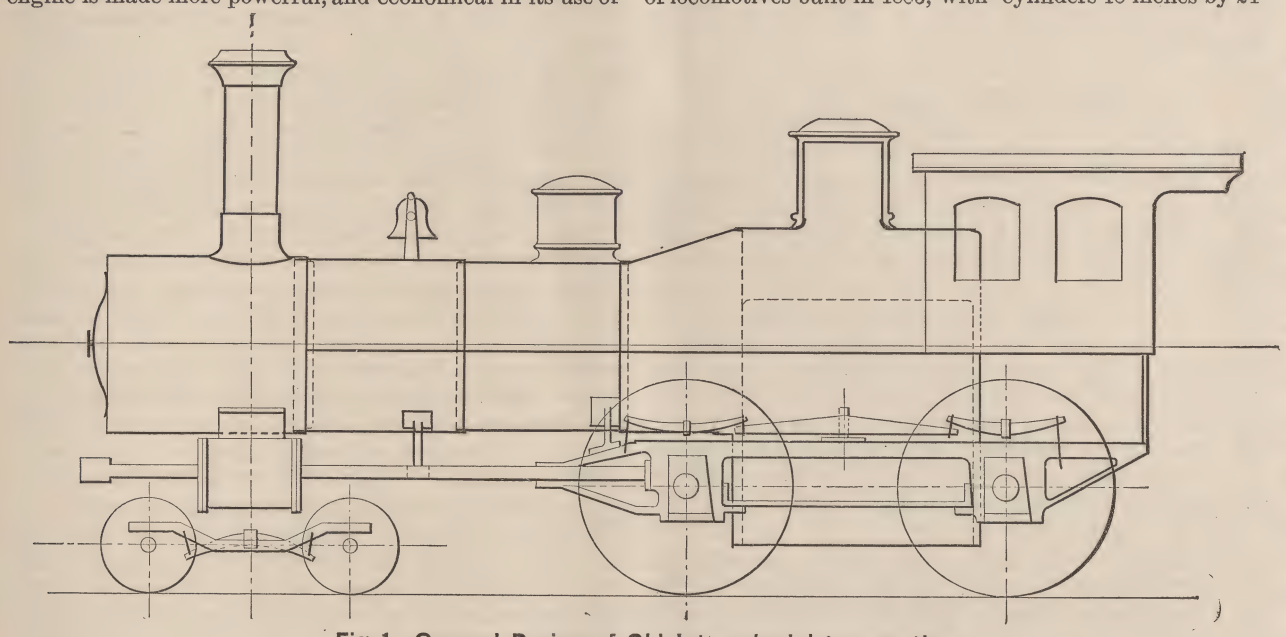


Fig. 1.—General Design of Old Intercolonial Locomotive.

In rebuilding old engines the advantages of replacing the old boiler with a new and larger one are sometimes considered very important, but on examination it is found that the frame is too weak to support a much heavier boiler than the one previously used. This is a bad stumbling block to the contemplated improvement, as if a new frame as well as a new boiler must be given the engine the cost will be considerable, and with the added cost of other necessary repairs will closely approach that of a new locomotive. These considerations sometimes cause the old boiler to be continued in use and allowed to "eat its head off" several times over again before it is finally scrapped. An incident illustrating this occurred several years ago on a road where fuel is expensive. It was shown that about a thousand dollars a year could be saved in fuel in each case by giving a certain class of old engines new and larger boilers, but stronger frames would have to be given the engines. The superintendent of motive power proposed to make the improvement, but in submitting the proposition to the general manager neglected to properly point out the economical advantages that would be gained by the change. The matter was immediately disapproved of, and the superintendent of motive power was asked if he was trying to bankrupt the company.

Instead of substituting new and stronger frames when larger boilers are added, it is sometimes possible to strengthen the old frames in such a way as to make them serviceable. The purpose of this article is to illustrate a method of doing this that has proved quite satisfactory. Mr. Francis R. F. Brown, Mechanical Superintendent of the Intercolonial Railway, of Canada, has met and solved this problem in a satisfactory way, and has sent us the drawings and photographs from which the following illustrations are made. Figs. 1 and 2 show one of an old class of locomotives built in 1883, with cylinders 18 inches by 24 inches, 69-inch drivers, with boilers 52 inches in diameter and having 16.5 square feet of grate area, and carrying 140 pounds steam pressure. These engines weighed 72,800 pounds in working order, 32,500 pounds of which was carried on the engine truck, and only 40,300 pounds on the drivers.

Mr. Brown sends us the following concise but interesting account of the methods followed in rebuilding these engines and adding larger boilers, and strengthening the frames to withstand the greater weight of the new boilers:

Editor National Car and Locomotive Builder:

The "Intercolonial Railway," as some of your readers may know, is owned by the Canadian Government. The management of the railway endeavors to keep pace with modern requirements, especially in its passenger service, necessitating increased weight of rolling stock, steam heating by the locomotive, and the latest air brake equipment. These all make their demands upon the locomotive, and more especially upon its boiler. To meet these demands the writer is rebuilding some locomotives. The changes made are described below.

The class of locomotives selected for rebuilding were built in 1883. The general construction of these engines is shown in the skeleton drawing, Fig. 1. These boilers being too small the writer decided on a Belpaire boiler with a 56-inch shell, having 22 feet of grate area and carrying 180 pounds pressure to the square inch.

Adding this boiler necessitated the strengthening up of the frames. To accomplish this, the main splice was fortified with two wrought iron wedges, carefully fitted, bolted and keyed. The center panel is strengthened with a wrought iron intermediate pedestal, placed in the center of the panel and bolted in position, and the back panel is built up by the cast iron foot plate, which is extended laterally to fill up the panel on each side, and is then secured with wrought iron stays reaching across the frames and secured with bolts and keys, all as shown in Fig. 4.

The extension of the firebox over the trailing axle entailed the adoption of underhung spring gear, arranged as shown in Fig. 4. The size of cylinders was reduced from 18 inches by 24 inches to 17 inches by 24 inches, and the American balance slide valve used. The diameter of the engine truck wheels was increased from 30 inches to 36 inches, and the truck centres were spread from 5 feet 4 inches to 6 feet 6 inches.

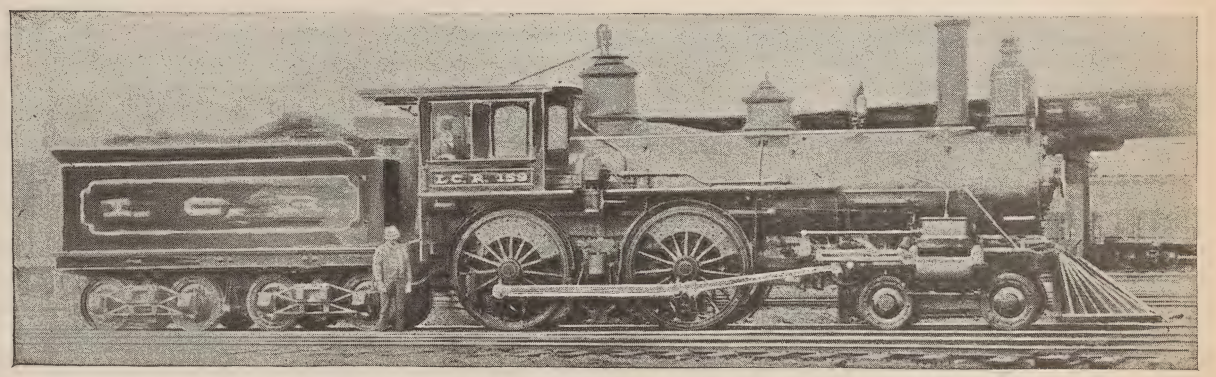


Fig. 2.—Old Standard Locomotive, Intercolonial Railway.

Fig. 3.—Standad Rebuilt Locomotive, Intercolonial Railway.

The total weight of the rebuilt engine in working order is 102,000 pounds, an increase of 29,200 pounds over the original engine. Of this increased weight 26,700 pounds is on the drivers, making the weight on driving wheels 67,000 pounds on the rebuilt as against 40,300 pounds on the original engine. The appearance of the original engine is shown in Fig. 2 and that of the rebuilt in Fig. 3, from photographs taken by the writer. The work of rebuilding was done in the Moncton shops of the Intercolonial Railway.

The boilers from the original engines are used in their turn to rebuild light 17-inch by 24-inch locomotives, and the trucks, cylinders, cabs, etc., all come in for, and are being used up on, repairs to other engines.

FRANCIS R. F. BROWN, M. I. M. E.,
Mechanical Superintendent Intercolonial Railway,
Feb. 14, 1895. Moncton, N. B.

The new boilers have a grate area 3.5 square feet larger than the old boilers, and the heating surface is decreased 218.78 square feet, the new boiler having 270 square feet less tube heating surface and 51.23 square feet more firebox heating surface.

The gross earnings of the Chesapeake & Ohio Railroad Company for last January were larger than for any previous January in the history of the company. They amounted to $780,554, against $756,069 in January, 1894. The net earnings for the six months ending December 31 were $1,700,000, the interest and charges were $1,500,000, leaving a surplus of $200,000.

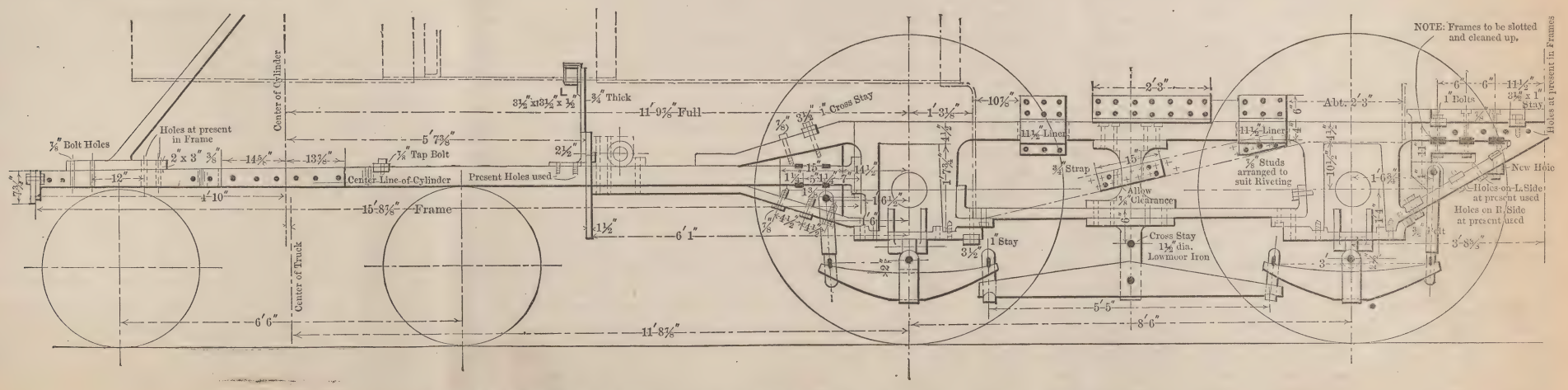


Fig. 4.—Method of Reinforcing Frames of Old Intercolonial Locomotives.

NATIONAL CAR AND LOCOMOTIVE BUILDER

ESTABLISHED IN 1870.

PUBLISHED MONTHLY

BY

R. M. VAN ARSDALE,

MORSE BUILDING.....NEW YORK.

GEORGE H. BAKER, Editor.

HERBERT W. POOL, Business Manager.

MARCH, 1895.

Subscription.—$2.00 *a year for the United States and Canada; $2.50 a year to Foreign Countries embraced in the Universal Postal Union.*

EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING PAGES. *The reading pages will contain only such matter as we consider of interest to our readers.*

Special Notice.—*As the* NATIONAL CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, correspondence, advertisements, etc., intended for insertion must be received not later than the 25th day of each month.*

Contributions.—*Articles relating to railway rolling stock construction and management and kindred topics, by those who are practically acquainted with these subjects, are specially desired. Also early notices of official changes, and additions of new equipment for the road or the shop by purchase or construction.*

To Subscribers.—*The* NATIONAL CAR AND LOCOMOTIVE BUILDER *is mailed regularly to every subscriber each month. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery, and in case the paper is not then obtained this office should be notified, so that the missing paper may be supplied. When a subscriber* **changes his address** *he ought to notify this office at once, so that the paper may be sent to the proper destination.*

THE REVIVAL OF INDUSTRY.

Those who have noticed the interesting items on the first page of our February and present issues must have observed a marked and gratifying increase in the number of items recording orders placed for new cars and locomotives. Our February issue recorded such orders aggregating over 1,800 freight cars and 20 locomotives, all for home roads. In addition to this, the same issue announced bids on about 5,000 more new freight cars. This issue records that contracts were made in accordance with a number of these bids, and 44 passenger cars, 58 locomotives and 7,205 freight cars have been ordered. The aggregate value, moderately estimated, of this large addition to the present equipment of our railroads is over $4,400,000. Bids are now being considered for 46 locomotives, 29 passenger cars and over 6,000 freight cars, the aggregate prospective value of which is over $3,600,000. There is good reason to believe that orders for this and much more new equipment will be placed early in March.

This assures a most gratifying increase in the many branches of manufacturing industry which contribute material that is used in one form or another in the manufacture of railroad rolling stock; and this means the re-employment of many hundreds of now idle workmen, the earnings of whom will enter nearly every imaginable channel of trade and stimulate countless industries.

AN OBSTINATE RAILROAD.

The Northern Railroad of France has received a deserved turning down in the matter of its brake practice by the French Ministry of Public Works. Although the Ministry recommended automatic brakes for passenger trains 16 years ago, and although this recommendation was adopted by all the large roads of France, except the Northern, this road has insisted on adhering tenaciously to the simple vacuum brake. In case of serious accident the trainpipe, with this arrangement, is generally ruptured and the brake rendered useless. Such accidents, attended with much destruction of property and great loss of life, occurred on this road in 1891, 1892 and on Sept. 9 last. Although in each of these cases the severity of the accidents was plainly due to the imperfect brake equipment and the wretched method of application (by the fireman on the engineer's order), yet the Chinese obstinacy of the management of the road prevented it from learning the lessons in safe brake practice that such disasters should have taught. Last September's collision killed six people and seriously injured 25 others. In commenting on the wreck at the time, we denounced the brake practice of the road as "simply criminal stupidity." Evidently the Ministry of Public Works has come to the same conclusion, for it has ordered that express trains on this road must all be equipped with automatic brakes as rapidly as possible; trains reaching 45 miles an hour must be so equipped within a year, and trains that reach 42 miles an hour must be so equipped in two years. All trains with continuous brakes must be so equipped as rapidly as possible, and all new cars intended for passenger service must have automatic brakes. The salvation of the French traveling public seems to be due in this case to the fact that it has a Ministry capable of ordering and enforcing safety conditions.

VESTIBULES FOR STREET CARS.

During the last three years vestibules have been applied to numerous electric trolley cars, as previously announced in this paper. The experiences of the last month suggest the importance of these as a means of protection for passengers, and especially motormen from the severities of intense cold weather. It has only been within comparatively recent years that any effort was made to make street car travel in winter time even a little bit comfortable. Young people still remember the abundance of straw that used to be placed on the floors of street cars in very cold weather. This was the only means that was provided for the protection of passengers from frozen feet. Finally stoves were added, and these have been improved and are now generally adopted in most northern cities.

The slow speeds of horse cars did not require very strongly any further protection for drivers than was afforded by their clothing. Electricity having come into general use as the motive power for these cars, and their average speed being greatly increased, the conditions are so altered that clothing even of the heaviest kind is inadequate to protect the drivers (who we now call motormen) from cold when running 10 or 12 miles an hour through opposite moving winds. The suffering of these men during such weather as we have had in the last month is very great, and their exposure undoubtedly causes much illness in their ranks and loss of life. Such exposure is quite unnecessary. The vestibule provides against it, and this form of construction has proved itself to be a protection and a convenience to passengers.

In most cities the street cars are overcrowded during the hours that busy people go to and return from their work. At such times the standing capacity of the car and rear platform is fully occupied. It is to the interest of the operating company that the passengers who are compelled to stand on the platform suffer no more from exposure to the weather than can be helped. Vestibules furnish protection from such exposure. As the interior of the car is warmed, so also should the vestibules at either end be warmed in cold weather, either by electric heaters or by a system of hot water pipes radiating from the car heater. As the front and end platforms are generally used alternately by the passengers and motormen, this arrangement would furnish equal protection to both from unnecessary exposure. While these advantages cannot be secured without cost, yet they are refinements of management that will undoubtedly pay handsome returns on the necessary investment by increased patronage. It is a fact that is too often ignored, that every improvement that makes travel on railroads of every description more comfortable and pleasant, increases the traffic receipts. Such improvements simply act this way: A contemplated journey is made either more desirable or less objectionable, and is more apt to be taken. This is true of street car travelers as well as of those who take longer journeys on railroads. Until recently there has been some discussion as to whether bad weather increased or decreased the number of passengers on street railroads. It has been definitely settled that bad weather reduces the number of such passengers. It acts to deter people from taking rides on street cars. It is plain that the best way to avoid this loss of traffic is to make the car journey less uncomfortable. Every step in this direction will surely result in increased receipts.

BROKEN COAL FOR LOCOMOTIVES.

It has been found necessary on some roads to supply passenger locomotives on hard fast runs with coal broken to the proper size for firing. Although the coal on such roads may be "soft" or bituminous, yet it is found that in order to get steam it must be furnished on the tender broken to the desired size, as the firemen on such runs have not sufficient time to break the coal and attend to their fire properly. The question is worth consideration by most general managers whose engines use a rather hard quality of bituminous coal, if it would not pay to furnish all locomotives in road service with coal that is broken at the chutes and carefully cleared of stone. This work usually devolves on the fireman. He is expected to break the coal to about egg size, and he is expected to tell either by sight or feeling when he has rock on his shovel instead of coal. To the experienced hand, the presence of a very small amount of rock among the coal will be declared by its extra weight. Good firemen attend to these matters closely, and the most intelligent ones soon learn that the labor they expend in breaking up the coal and ridding it of impurities is not extra labor at all, but simply well directed labor. The work thus expended is saved them by the consequent lessened amount of coal they need to shovel on the fire.

The trouble is that even economically disposed firemen have not always the necessary time to break the coal up properly and rid it of rock. This is specially true if the coal is very hard or badly mixed, or if it is dumped on the tender in very large lumps. We have frequently seen lumps of coal on tenders that were half as large as the fireman, and weighed quite as much. Such lumps are always a discouragement to firemen, but they are doubly so when they find lodgement against the coalgate and impede access to all the coal in the tender. Such lumps have a Satanic habit of doing this. The boards of the coalgate protect them for a long time from the fireman's coalpick. Sometimes locomotives suffer for steam from this cause, and such occasions are not rare in very bad weather when a locomotive's demand on the coal pile is most urgent and when coal-chute men are generally most careless.

Before the Chicago, Burlington & Quincy enginemen struck six years ago, the firemen demanded cracked coal for the engines. The demand was a mistake, and brought upon them the ridicule of the daily press, which declared that they would next want "cracked ice to cool their heated brows." Although a mistake when made as a demand, the suggestion of providing properly broken coal to engines was afterward adopted voluntarily by the company, and mines that produced coal that was hard to break were required to use mechanical crushers for this purpose, and the results were very satisfactory in every way.

There is no doubt that any railroad company using coal that is hard to break will save money by putting such coal on tenders broken to as near egg size as possible. Generally speaking, this sized coal is best adapted for a hard working locomotive's fire. The demands on the boiler require that it should be about this size, and economical combustion is promoted by its being so. Both the efficiency and economy of the engine is lowered if it is not so, therefore it is plain that the matter is one of considerable importance. Being so, it should not be neglected as it is now on a great many roads.

If it is not thought practicable to furnish broken coal all the year around, it should be specially considered if such coal should not be provided during severe winter weather when, as before stated, the demands on the fire are greatest. Certainly the practice of coal-chute men in dumping excessively large lumps on tenders should be stopped. These men generally have comparatively good light to work by, and the large lumps as they are met with are before them free of obstruction and in position for being easily broken into moderately-sized pieces, say the size of a man's head, and under no circumstances should they be allowed to put coal on tenders in larger lumps than this.

THE SPAN OF A LIFE.

An aged lady, Mrs. Margaret Cook, was buried at Columbus, O., Feb. 8. This fact is of unusual interest to all engaged in steam engineering because the lady was the last survivor of the passengers who rode on Robert Fulton's *Clermont* during its trial trip in 1807. She was born in Albany, N. Y., in 1806, and was a babe in arms when taken aboard the *Clermont*. It is said that Fulton was so highly complimented by the confidence of Mrs. Cook's parents that he stopped the boat on its way up the Hudson river and purchased a basket of fruit for them.

Although the *Clermont* was not the first practically successful steamboat built, it was the first to make steam navigation an everyday commercial success. On this boat there was the first application of the steam engine to boat propulsion which was not followed by the retirement of the experimenter before the practical success of the plan was permanently assured. So we are accustomed to think and speak of Fulton's *Clermont* as the first practical steamboat; but 112 years before Fulton began his experiments a man named Papin proposed to use a steam engine to drive paddle wheels on a boat. Seventeen years later this man used a pumping engine to force water against a wheel on a boat, which in turn was made to drive the paddles. Sixty-one years later, in 1774, a French nobleman, the Comte de Auxiron, built a steamboat, but was unsuccessful in its operation. Four years later another Frenchman, the Marquis de Jouffroy, experimented with rather a large steamboat and somewhat successfully, but political disturbances terminated his work. Eight years later, in 1786, James Rumsey, an American, used an engine to run a pump which forced a stream of water aft, thus propelling the boat forward at the rate of four miles an hour against the current of the Potomac river; at Shepardstown, Ind. Later he employed another plan of steam propulsion, which succeedrd in making his boat go eight miles an hour at Philadelphia. In 1788 Patrick Miller employed a steam engine to operate paddle wheels on a boat on Dals Winton Lake, Scotland. His boat made five miles an hour. The next year he built a boat that made seven miles an hour. In 1801, 11 years later, William Symmington, who was previously connected with Patrick Miller in his experiments, was employed to make a steamboat to supplant horse power on canals. He built the *Charlotte Dundas*, which was so successful that eight similar boats were ordered. Alas! for the fame of Symmington, the order was never filled, owing to the early death of the Duke of Bridgewater for whom the boats were to be built. No one else had sufficient confidence in the practicability of his plans to aid him.

About this time Robert Fulton was giving this matter attention, and two years later he built a small steamboat, the hull of which was so weak that when nearly completed the weight of the machinery literally broke the little craft in two and she sank at her moorings. Truly a miserable beginning! There is an old proverb that "a bad beginning makes a good ending." Fulton verified this. He promptly recovered and rebuilt the wreck, with which he conducted experiments that constituted the foundation of his later complete success. Four years later, in 1807, the *Clermont* was launched on the East River at New York, and steam navigation with all it was to accomplish in the affairs of man was begun.

It is not our purpose to review the results accomplished by steam navigation. Our interests are primarily locked up in the iron horse, so we will leave to others the task of reciting the wonders accomplished by steamboats and steamships. But it must be remembered that Fulton's steamboat was the actual beginning of the transportation of the world's traffic by steam, and this is of interest to all who are in any way connected with such transportation now. The point of interest lies in the fact that all of the ramifications of the great steam transportation service of the world have grown up and branched out within the span of a single human life. That life was new on the *Clermont*, and it closed the other day at Columbus; its close almost marks an epoch in the history of steam engineering.

February distinguished itself as being the worst month in point of weather that we have had in the last ten years. Its cold was excessive in all parts of the country, from the Gulf States northward, and from the Atlantic States westward. Trains were blocked by snow in Florida! and Southerners were treated to the unusual sport of snowballing and sleigh riding. In the Northern States the delay to traffic, both passenger and freight, was unusually great, nearly every railroad being more or less badly crippled on several occasions by snowbound trains and "dead" engines. The hardships entailed by such weather, and these must be borne by the train and engine men principally, are very great and test to the utmost the endurance of these generally faithful men.

Literature.

King's Handbook of New York City. Moses King, Boston, Mass. Price $2.

As its name indicates, this book is historical, descriptive and illustrative of New York City. It contains 1,008 pages and 1,029 pictures from photographs.

Pocket List of Railroad Officials. Issued quarterly by the *Railway Equipment Guide*, 326 Pearl street, New York. Price $1 per year.

This is a list of railway officials alphabetically arranged and of a size convenient to carry in the pocket. It gives also the names of National and State railroad commissioners, and this list includes those of Canada as well as of the United States.

Transactions of the American Society of Mechanical Engineers. Vol. XV., 1894. Published by the Society, 12 W. Thirty-first street, New York.

This book is the official report of the twenty-eighth and twenty-ninth meetings of this society, the former being the fourteenth annual meeting, held in New York in December, 1893, and the latter meeting being held in Montreal, late in 1894.

Around the World with the Transportation Commission of the Field Columbian Museum.

Harper's Weekly is to have the exclusive use of all nontechnical material, photographs, descriptive letter-press and drawings emanating from this expedition, the departure of which we announced some months ago. The first article of the series appears in the number dated Feb. 23, and is well illustrated and very interesting. The Commission is engaged collecting in all countries information, and, as far as possible, exhibits, illustrating the past and present of human transportation. It will not confine its attention to railways, but will investigate the appliances both by sea and land by which men in all countries have attempted to solve the question of transportation.

Popular Scientific Lectures. By Ernest Mach. Translated by Thomas J. McCormack. Pages, 313. Price, $1. Cloth, gilt top. The Open Court Publishing Co., 324 Dearborn street, Chicago.

This is a new book by the gifted German Professor of Physics in the University of Prague. We have before had occasion to commend the excellent translations of Mr. McCormack, so that the language of the book is all that can be desired. The work is a very interesting and instructive one. The lectures are well illustrated by good engravings and there is a good index. The titles of the lectures are: The Forms of Liquids; The Fibers of Corti; On the Causes of Harmony; On the Velocity of Light; Why Has Man Two Eyes? On Symmetry; On the Fundamental Concepts of Static Electricity; On the Principle of the Conservation of Energy; On the Economical Nature of Physical Inquiry-On Transformation and Adaptation in Scientific Thought; On the Principle of Comparison in Physics; On the Relative Educational Value of the Classics and the Mathematico-Physical Sciences.

Manual Practico del Maquinista Conductora de Locomotoras, by J. J. and A. J. Elordi, La Plata, Argentine.

As our Spanish editor is absent we must deplore our inability to tell our readers exactly what this book is, but from our imperfect knowledge of that beautiful language we judge that it is a manual of practical knowledge for locomotive drivers or engineers in reference to the care and management of locomotives. It is printed in Spanish and is the only book on the subject in that language that we know of, therefore it may be imagined how very beneficial it will prove to the locomotive engine men of Spanish speaking countries. After a brief historical review of railroads and locomotives, a description and explanation is given of the various parts of locomotives, and rules for the care and repair of its mechanism. There is a chapter on compound locomotives, on tenders, and on different types of engines.

The second part treats of the general care and management of locomotives. This treats of lubrication, combustion and the formation of steam. There is a great deal more in the book that we are unable to talk about. Engravings illustrate nearly all the principal parts of locomotives.

The book is of interest to Americans simply as showing that steps are being taken to educate the enginemen of South American railroads in matters of steam engineering that, for the sake of economy of repairs and of fuel, they should be entirely familiar with. Coal on some of these roads costs $15 a ton in gold. Those who know anything about the influence on coal consumption effected by educating engineers and firemen in such matters as this book does, will know that we do not exaggerate when we say that the book of Señor Elordi's is worth several times its weight in gold to the interests that locomotives serve, when placed in the hands of the men who run and fire these expensive machines.

Railway Construction in 1894.

The *Railway Age* announces that a total of 1,948 miles have been added to the railway mileage of the United States during the past year, besides 356 miles in Canada and 75 miles in Mexico. This is the smallest increase that has been made in any year since 1875, and is less than the new mileage of every year but three in the last 30 years.

Commenting on this construction, our contemporary says:

Considering the depressing condition of general business during the year, and especially the distrust of railway securities naturally inspired by the appalling record of railway bankruptcies, it is perhaps surprising that even this comparatively small mileage was built. At the low average of $20,000 per mile for construction and equipment the new mileage represents an outlay of nearly $40,000,000 that has gone to provide transportation facilities, all or nearly all of which were needed, while it will henceforth give occupation to about 10,000 persons, and thereby provide support for perhaps 50,000 people—thus constituting an important and beneficent addition to the industrial wealth of the country. A new manufactory, a new store, or even a new farm, may possibly mean no addition to the industrial force of the country for in each case it may mean the closing of an old industry somewhere; but the opening of every new railway necessitates an increase in the number of people employed, no matter whether the investment proves profitable or not.

How Track Bolts Get Broken.

Mr. J. N. Barr, in his paper on "The Scrap Pile," which was published in the January issue of the NATIONAL CAR AND LOCOMOTIVE BUILDER, said that nearly all track nuts found in the scrap pile had stub ends of bolts in them. Continuing, the paper said:

"The first impression produced was that the wrenches used by the trackmen were long handled or the trackmen were unusually robust. A close inspection revealed the fact that each nut showed decided indentations on the outside. The trackman found that the most expeditious method of removing the bolts was to administer a sharp blow with the maul. A man receiving $1.50 per day can by this method remove at least 10 kegs of bolts, worth about $25, and he converts this $25 worth of material into scrap worth to the company $3 or $4. The economy of the process is, to say the least, doubtful."

A writer in the last issue of the *Roadmaster and Foreman*, Mr. Jerry Sullivan, criticises from a trackman's standpoint this part of Mr. Barr's paper, as follows:

Now, Mr. Barr, we want to give you a few pointers about this matter. In the first place, it is all nonsense to think any man ever spent all day or even an hour or five minutes at a time knocking off bolts.

In the next place, only bolts that cannot be used again are sent to the scrap pile, therefore the scrap pile contains only those with broken threads or those having broken bolt ends in them; and this is the reason the bolt ends are there. The foreman wants to change a rail, perhaps in a hurry. One man is ordered to pull spikes and two are told to take out the bolts. The man with the claw bar gets through first, then one man gets his end of the rail unfastened; then those two men and the foreman and perhaps two flagmen wait on the man with the other wrench, who grinds away, making a horrible squeaking noise as the nut cuts its way around the bolt. The foreman steps up and, seeing that there is about one-half inch of rusty bolt still outside the nut and knowing from the sound that the nut is gathering up around the bolt and stripping the threads, decides it is ruined anyhow, and orders the man to break it off and waste no more time.

Now, let us see how long it will pay to fool with a rusty nut. Take this same gang, two flagmen, three men at work on the rail and the foreman. At the wages you stated, Mr. Barr, these men would cost the company $9 per day, being 90 cents an hour, or 1½ cents per minute. A keg of bolts worth $2.50 contains about 240 3½ × ¾ inches bolts, making each bolt worth about one cent, therefore it would not pay for such a gang to wait over one minute on a rusty bolt. We admit, Mr. Barr, your paper was an excellent one, and will do a great deal of good, but when it comes to talking about nuts, why, you are off your—bolt. But if you will take the purchasing agent by the ear and tell him to quit buying bolts that are from ¾ to 1¼ inches too long, and explain to him that there is no need of more than one thread outside the nut when it is tight and any more simply causes annoyance in the track department from the rust of the projecting bolt, and the sarcastic remarks of the higher officials, we will forgive the past.

Collapse of a Foolish Railway Scheme.

The rock-bound coast of Oregon is indented about 125 miles south of the mouth of the Columbia by a fine bay called Yaquina, which, by the aid of improvements made by the Government, has been converted into a good harbor for vessels of moderate draft. The surrounding country is a heavily timbered wilderness and the Coast Mountains cut off communication with the fertile valley of the Willamette, which lies between this range and the much loftier chain of the Cascade Mountains. About a dozen years ago an enterprising Scotchman named Hogg studied the peculiar geography of Oregon and made up his mind that a railroad from the Willamette Valley to Yaquina Bay would draw off to the ocean a large part of the wheat that goes down the valley to Portland and out to sea by way of the Columbia.

He organized a company, enlisted a good deal of Scotch capital and after many financial vicissitudes succeeded in building some 50 miles of road from the bay of Corvallis in the valley. There he rested for a few years. He did not get the wheat of the valley for an obvious reason. The existing roads running lengthwise of the valley gathered up the grain from the farms and continued to haul it to Portland, where the center of commerce for the region is located, as it was for their plain interest to do, instead of turning it over to Mr. Hogg's little line. Mr. Hogg then raised more money and built on eastward across the valley to the base of the Cascade Mountains. Still he could not divert commerce from its established channel. He got a little wheat to haul from farms along the line of his road, but he could not make the line pay. Then he went back to Scotland and convinced his friends that the thing to do was to give him more money and lots of it, so he could build across the Cascades, and over the desolate arid plains of Eastern Oregon to Boise, in Idaho.

Once at Boise he hoped to attract the Northwestern, or the Burlington, to build 1,000 miles of road to connect with him, to adopt his line as a Pacific Coast extension and to make a terminal city at Yaquina that would rival Portland. He continued to tap the pockets of the rich Scotchmen in Glasgow, Edinburgh and Aberdeen until he had actually got eleven millions of dollars out of them. All he could show for their money was 147 miles of railroad, ending in a gorge on the western slope of the Cascade Mountains. On this small mileage of completed road there are outstanding $15,000,000 of bonds and several millions of stock, and there are unsecured debts in the form of receivers' certificates, unpaid interest, wages, etc., amounting to $910,000. On Dec. 22 the property was sold at auction and was bought by Messrs. Eddy & Hammond, merchants and contractors of Missoula, Montana, for the trifling sum of $100,000.

Geological explorations made in connection with the Seberian Railway have revealed the existence of a large number of coal deposits near the proposed line.

It is announced that Cape Colony has joined the Universal Postal Union. The Union now includes every civilized country, with the exception of the Orange Free State, and several small islands in the Orient and Africa.

The Northern Pacific has put into effect a new schedule which reduces the time between the coast and St. Paul by five hours. The through overland train leaves Portland at 9 a. m. instead of 5 p. m. as heretofore, arriving at St. Paul at 5:55 p. m.

Mr. Sturtevant Fish, President of the Illinois Central Railroad, has demonstrated his ability as a manager of great interests. During the recent depression the property he controls has shown up in a way to surprise financiers. The Illinois Central has held its own, and its earnings have been phenomenal. Mr. Fish deserves much of the credit for the result, and has shown himself a man of much financial and executive ability.

A bill for the abolition of grade crossings has been drawn by the New York State Railroad Commissioners. The bill provides for a division of the expenses of the work. When new railroads are built, the cost of avoiding grade crossings is to be met entirely by the company; when established ones are abolished, the company must pay 62½ per cent. of the expense, the municipal corporation 25 per cent., and the State 12½ per cent.

It is the intention of the Postoffice Department eventually to establish in all the larger cities railway mail routes on the various street systems for the delivery of mail matter, not only in the heart of these cities, but among the suburban places along the line of the roads. In some of the larger cities routes have been established on surface roads which have proven of considerable benefit, and the department as soon as practicable will establish others, the expenses of which will be met by the fund used for railway transportation.

A peculiar substitute for window glass, known as "tectorium," is stated to have been for some time employed in Austria, Italy, Germany, Switzerland and Russia as a covering for hothouses, verandas, windows of factories, roofs of stores, etc. It is an insoluble, bichromated gelatine, translucent as opal glass and incorporated in wire gauze, and it is said to refract the rays of the sun. It is tough and flexible, bends without breaking, does not dissolve in water, and is not injured by frost. It is a bad conductor of heat, and becomes stronger, it is stated, the longer it is exposed to the air.

The Union Depot at St. Joseph, Mo., was destroyed by fire on the night of Feb. 9, involving losses in station building, hotel, baggage, mails and express matter which, it is estimated, will aggregate $500,000. Plans are being made for a new depot on a different site. The building was 400 feet long and 50 feet wide, and was entered by the following roads, who share the losses: Hannibal & St. Joe, Missouri Pacific, St. Joe & Grand Island, Kansas City, St. Joe & Council Bluffs, St. Joe & Des Moines, Chicago, Rock Island & Pacific, Burlington & Missouri River, Union Pacific and the Atchison, Topeka & Santa Fe.

The Massachusetts law in reference to fires caused by sparks from locomotives is very unjust to railroad companies, and railway officials are trying to have it changed so as to be somewhat fairer. In event of a claim being made that a fire was caused by a spark from a locomotive, the burden of proof that such was not the case rests with the railroad company. The law as at present makes railroad companies liable for damages from fire caused by a spark from a locomotive, but does not give them the benefit of any insurance on the property even though the premiums on the insurance may have been regularly paid.

A patent has been granted to C. Raleigh, of Johannesburg, South African Republic, for an invention which consists in mounting the bodies of passenger coaches upon cushions containing elastic fluid, which are inserted between the body of the coach and the frame. The elastic fluid may be confined in flexible bags, rectangular in shape, and nearly as long and wide as the vehicle body. The cushion, which is of suitable depth, may be separated by webs into compartments, so as to maintain a proper distribution of the fluid throughout the cushion. The coach body may be raised by screws fixed on the truck frame and the elastic fluid pumped into the cushion to fill the compartments. The body is then lowered on the cushion and loosely held in place by a suitable flexible coupling.

Personal.

Mr. P. W. Resseman has been appointed Superintendent of the Ottawa & Gatineau.

Col. William H. Ross has succeeded Mr. N. E. Harris as receiver of the Macon & Northern Railroad in Georgia.

Mr. N. S. Kimball, Master Mechanic of the Chicago, Milwaukee & St. Paul, at Green Bay, Wis., has resigned.

President F. J. Kimball, of the Norfolk & Western, and Mr. Henry Fink, have been appointed receivers of that road.

Mr. James M. Phillips, late General Superintendent of the Kentucky Union, died at Dallas, Tex., Feb. 4, at the age of 57 years.

Mr. H. E. Yarnall has been appointed Purchasing Agent of the Choctaw, Oklahoma & Gulf, with office at South McAlester, I. T.

Mr. S. B. McCormack has been elected General Manager of the Tennessee Coal, Iron & Railroad Company, vice T. H. Aldrich, resigned.

Mr. David L. Barnes, Consulting Engineer, of Chicago, has moved his offices from the Rookery Building to the Monadnock Building.

Mr. Wilbert Erwin, Superintendent of the Texas Central Railroad, fell from a train near Terrell, Tex., on Jan. 25 and was instantly killed.

Mr. Burton Foster has resigned as General Manager of the Toledo & Maumee Valley, and Mr. H. C. Ellis has been appointed to succeed him.

Mr. William Spencer has been appointed Master Mechanic of the Atlanta & Florida, with office at Atlanta, Ga., vice A. W. Collier, resigned.

Mr. Edward W. Jackson is reported to have tendered his resignation as General Manager of the Interoceanic Railway of Mexico to take effect May 1.

Mr. Prentiss, of the Cleveland Twist Drill Company, Cleveland, O., has recently started on a trip around the world, and is to be absent about six months.

Mr. Robert G. Fleming, General Superintendent of the Savannah, Florida & Western, was stricken with paralysis on February 12 at Savannah, Ga., and died February 20.

Mr. William Thornburgh has been appointed General Superintendent of the Columbus, Sandusky & Hocking, with headquarters at Columbus, O., to succeed Mr. H. O. Pond, resigned.

Mr. George A. Burt, of New York, has been appointed General Manager of the Ohio River Railroad, with headquarters at Parkersburg, W. Va., vice J. Clinton Gardiner, resigned.

Mr. R. B. F. Pierce, General Manager of the Indiana, Decatur & Western, has been appointed receiver of the Toledo, St. Louis & Kansas City, to succeed Mr. S. R. Callaway, resigned.

Mr. G. C. Goss, formerly Purchasing Agent of the Cincinnati, Portsmouth & Virginia, and afterward Superintendent of the Dayton, Lebanon & Cincinnati, died recently at Winchester, O.

Mr. B. Thomas, formerly General Manager of the Chicago & Western Indiana, has been elected Chairman of the General Managers' Association of Chicago, to succeed Mr. E. St. John, resigned.

Mr. R. B. Cable, General Manager of the Florida Southern, has resigned and the office is abolished. Its duties are assumed by Mr. W. B. Denham, Superintendent, whose office is at Palatka, Fla.

Mr. Walter C. Quincy, General Manager of the Monongahela Connecting Railroad, died at Pittsburgh, Pa., Feb. 3, after an illness of several months. He was 64 years of age, and had been in railway service since 1849.

Mr. Thomas Riley, formerly General Superintendent of the St. Louis, Kansas City & Colorado, at St. Louis, has been appointed Superintendent of the Monterey & Mexican Gulf road, with headquarters at Monterey, Mex.

Mr. A. Dolbeer, formerly Superintendent of Motive Power of the Buffalo, Rochester & Pittsburgh, and later Master Mechanic of the Lehigh Valley at Buffalo, has been appointed Superintendent of the Boise Steel Carwheel Works at Scranton, Pa.

Mr. H. M. Perry, formerly Superintendent of the United States Rolling Stock Company, and more recently Foreman of the car department of the Cincinnati Southern, at Ludlow, Ky., has resigned to accept the position of Manager of the Madison Car Works at Madison, Ill.

Mr. Geo. C. Smith, Master Mechanic of the Baltimore & Ohio at Grafton, W. Va., has been transferred to Keyser, W. Va. He is succeeded at Grafton by Mr. S. A. Souther, formerly General Foreman of the Benwood shops. Mr. Jas. F. Pendergast in turn succeeds Mr. Souther.

Mr. C. A. Hammond, Secretary of the American Society of Railroad Superintendents, has become editor of *Transportation*, a monthly paper published in New York. We understand that under Mr. Hammond this paper will be devoted principally to matters of interest to railroad superintendents.

Mr. Bradford Dunham, General Superintendent of the Alabama Midland, has been appointed general superintendent of the Plant system of roads, including the Savannah, Florida & Western, South Florida, Charleston & Savannah, Brunswick & Western, Alabama Midland, Abbeville Southern, and Silver Springs, and the Ocala & Gulf roads. His headquarters will be at Savannah, Ga.

Mr. Eugene L. Maxwell, of the well known mechanical supply firm of Manning, Maxwell & Moore, of New York, died of apoplexy at his home in Brooklyn, N. Y., Feb. 9, Mr. Maxwell was 44 years old, and had been in the machinist supply business abont 20 years. He was President of the Pond Machine Tool Company and of the Ashcroft Mfg. Co., and Vice-President of the Shaw Electric Crane Company.

Mr. Loren Packard, Division Master Car Builder of the New York Central at West Albany, died at Albany, Feb. 15. Mr. Packard had been ill about two months. He was 52 years old. His railroad experience covered nearly 20 years and his car building experience covered nearly 30 years. After serving several years in the War of the Rebellion he entered the works of the Wason Car Manufacturing Company, and remained there 11 years, being foreman of the shops for several years. He entered railroad service in 1876, as Master Car Builder of the New York, New Haven & Hartford. He went from there to the Baltimore & Ohio, where he was Master Car Builder at Baltimore. He left there to go on the New York Central 11 years ago. He has been a member of the Master Car Builders' Association for 14 years.

Mr. George C. Smith, formerly Chief Engineer of the Chicago, Burlington & Quincy, died at his home in Chicago, Feb. 18, aged 57 years. Mr. Smith resigned his position on the C., B. & Q. in 1889 to go to Uruguay as Chief Engineer of Construction of a road to be built for the State from Montevideo to Colonia and westward along the Uruguay river. The inducement for his services was somewhat alluring ($15,000 per year), but it was the fatal move of his life. Financial difficulties overwhelmed all new South American enterprises in 1890, and the *Ferro Carril del Oeste*, Mr. Smith's road, was one of the unfortunates. He returned home in 1891. Worry over the misfortunes of the enterprise he was connected with, and over the resulting embarrassments caused the party of railroad men who followed his lead to Uruguay, brought his fatal illness. Mr. Smith was an excellent engineer and a man of excellent character. Liberal, progressive and broad-minded—what railroad men call "a broad gage man." He always was interested in the welfare of his subordinates, and therefore always enjoyed their hearty and loyal service. He was known by honest men but to be respected and esteemed. He leaves a widow and a daughter, a little girl.

The Conductor's Story.

When a man has been railroadin' twenty long years
He gits kinder hardened an' tough,
An' scenes of affliction don't trouble him much,
Cause his natur' is coarse like an' tough.

But a scene that took place on my train one cold night
Would a' melted a heart o' stone;
An' among the adventures which I have been through,
That night jist stands out all alone.

'Twas a bitter cold night and the train was jam full,
Every berth in the sleeper was taken;
The people had jist turned in for the night,
An' the train for New York was a-makin'.

When, jist as the people to snore had begun,
An' I, with a satisfied sigh,
Had sat down in a chair for a short rest, I heard
The sound of a young baby's cry.

It was one o' those loud, aggravatin'-like yells,
O' the pattern that make you jist itch
For a gun, or an ax, an' excites up your mind
With wild thoughts o' murder an' sich.

It went through that car an' I needn't remark
That the snorin' stopped right there an' then,
An' that sleeper was filled with a bilin' hot crowd
O' mad women and wild, swearin' men.

The curtains jist then that concealed berth sixteen
Were opened an' out came a man,
As fine a young feller as ever I seen,
But his face was all white like an' wan.

He carried the kid that was raisin' the row,
An' commenced walkin' down through the aisle,
A tryin' to stop its loud screechin'—but pshaw;
It seemed to get wuss every mile.

An idea seemed to strike one old feller jist then,
An he said to the pale faced young man:
"It seems to me, stranger, that kid could be stilled
By a simple and feasible plan:

"The noise that it's makin' betrays what it needs—
The child wants its mother, that's plain;
An' why don't you call her? Ten chances to one,
She's sleeping somewhere on the train."

A look then came over that young father's face,
A look full of anguish and pain;
A look that will haunt me as long as I live,
As long as I work on a train;

An' he answered that man in a hoarse, stifled voice,
That sounded as though from afar—
"Her mother is sleeping on board of this train
In a box in the baggage car."

The New York and Florida Short Line (comprising the Pennsylvania Railroad, the Southern Railway, and the Florida Central & Peninsular Railroad) has started a fast train service between New York and Florida. It is known as the "Florida Limited," composed of the latest dining and sleeping cars. The train leaves New York at 3:20 p. m. daily, and reaches Jacksonville the following evening at 7 o'clock, and St. Augustine at 8:15 p. m., in time for dinner. The new schedule reduces the time by nearly two hours over the previous running time.

The Baltimore Belt Railroad Tunnel.

The Baltimore *Sun* says that to Mr. John B. McDonald, of Ryan & McDonald, belongs the credit of conceiving the utility of and practicability of building a railroad under Baltimore. Mr. McDonald is an experienced railroad contractor, who first went to Baltimore as contractor for a portion of the Baltimore & Ohio's Philadelphia division. He had not been long in the city before he saw the disadvantages under which the Baltimore & Ohio labored in transferring trains at Locust Point to make connection with its new Philadelphia line. He knew that for the company to successfully compete for business it must overcome this difficulty. To go through the city on grade was impracticable, and the legislative right to do this could not be secured.

Then the idea of tunnelling under the city was adopted and impressed on the railroad officials, and on Dec. 2, 1889, an ordinance was introduced in the City Council giving the right to build the tunnel. At the following session of the Legislature a State charter for the Belt Road was obtained.

Mr. McDonald secured the contract for building the tunnel Sept. 4, 1890, and its excavation was begun Sept. 10, six days later. The tunnel proper is one and a half miles long, and, including the open cut below Camden street and at the Bolton lot, is nearly two miles long. It is 22 feet high throughout its length and 27 feet wide, except where it passes into the Bolton lot and under Howard street, between Pratt and Lombard streets. There its opening is spread like a bell. This is done to accommodate extra tracks to facilitate the rapid movement of traffic, when the tunnel is in use. The bell mouth at the Bolton lot is 55 feet wide, and is the largest tunnel opening in the world. The brick work of the arch is set 22 inches. Back of this is a subwall 18 inches thick, filled in with crushed stone and grouting, making a compact and solid wall 40 inches thick.

The Protected Right-of-Way of English Railroads.

In presenting some notes of English railway practice to the Western Railway Club at its January meeting, Mr. F. A. Delano said:

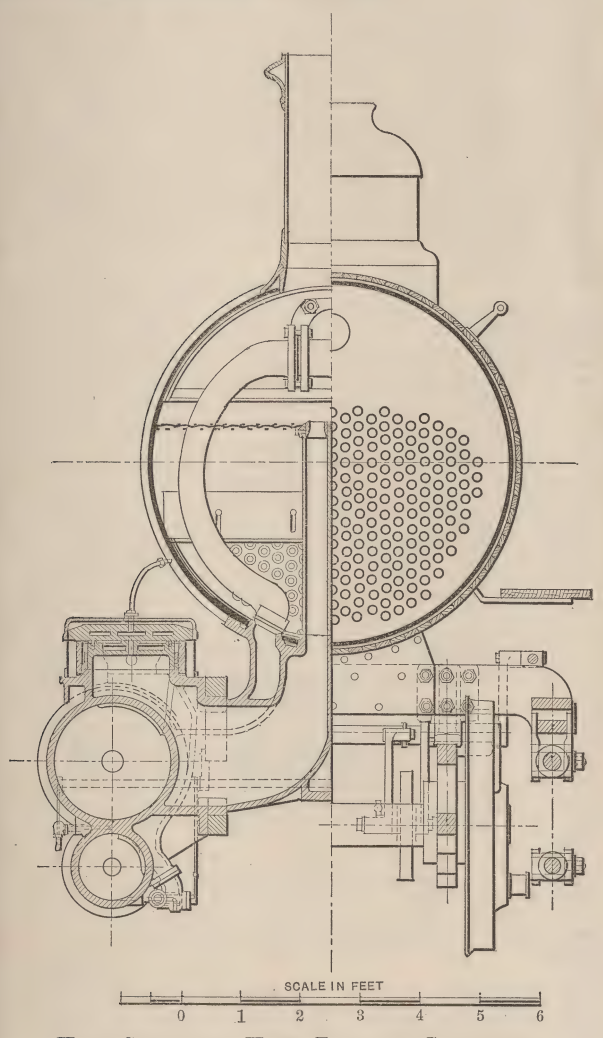
"The right of way is usually well fenced or walled, but besides this there is usually a hedge of well-clipped hawthorne. What with the high parapet walls and the fences and hedges the railways enjoy a privacy from public scrutiny and harsh criticism which makes an American wish we had the same here. When one is walking or driving in England he is hardly conscious of the existence of the railway till he comes upon it and either sees the smoke of a train overhead or hears its rumble beneath. It may be argued that this seclusion is obtained only at a great cost and is therefore not generally possible in America; and so far as it means the entire separation of grades between highways and the railway that is so; still in America it is not our habit to shut out the railway from public view, even where it could be done at comparatively small expense. The explanation of this difference is to be found in the characteristics of the people. It is a thoroughly English custom, displayed by every landowner, big or little, to shut his property in for his own and his friends' use and pleasure.

"An Englishman cares very little to display his garden and lawn to the outside world; he thinks far more of his private and unmolested enjoyment. Another reason for the seclusion of the railways is doubtless due to the hostility which the early builders met in constructing railways through large estates and farms. The railway was looked upon as a nuisance, and the idea was to keep the locomotive as much out of sight as possible. Railways in England were built in an already thickly settled country, and through already valuable property; the development took place in spite of opposition and restriction from the first; while in America the development of the railway being in most cases essential to that of the country, it was encouraged and fostered in every possible way and only after the network of lines became so dense that the railways, however cheaply constructed, could not in many cases earn a livelihood, did public opinion change its attitude of fostering care to that of oppression and suppression. This is a familiar dogma for the railway orator and I would not advance it here were it not that the reason for the differences between English and American railway practice lie in this so oft-mentioned fact. In a nut-shell, it may be said that English railways have developed slowly and surely against constant restriction, while ours had a "hot-house" growth, favored unwarrantably, and then were exposed to the severe "frost" of public criticism, restriction, interference and amounting in some cases even to virtual confiscation.

"The history of railway development is not alone in this respect; the same is true of the development of most branches of mercantile or manufacturing enterprises in America. We have an example at the present time of the phenomenally rapid growth of the electric street-car systems. Every town has its electric cars now, and franchises are given away right and left without restrictions, but the day of reckoning is sure to come, not only from the competition of the many lines, but because the public will eventually begin making requirements and restrictions which can only be complied with at great cost."

The Dunbar Compound Locomotive.

The engravings on this page reproduce drawings sent us by Mr. H. D. Dunbar, the inventor of the well known and formerly widely used original Dunbar piston packing, and show the design of a compound locomotive he has invented, patents on which he secured last fall. The principal features of the design are the two rods connecting with the high and low-pressure pistons, respectively, and the connection between these. This connection requires that the low-pressure cylinder shall be uppermost, and the general design is arranged accordingly.



HALF SECTIONAL VIEW THROUGH CYLINDER.

The object of the design is to secure an economical, powerful and smooth working engine that will be lighter on repairs than other types of compound locomotives. The following are among the advantages claimed for the design:

The low pressure pistons pass the center ahead of the high pressure pistons. This permits less lap on the low pressure valve, thereby cutting off steam later in the stroke for the low pressure than for the high pressure (the reverse lever being in the same notch), and avoiding the excessive lead on low pressure valve caused by cutting off lap in order to carry steam further in the low pressure cylinder. Excessive compression in the high pressure cylinder is avoided, when cutting off close, say from five to eight inches in the high pressure.

POINTS OF CUT-OFF.
(*Measurements in Inches.*)

ENGINE RUNNING AHEAD.				ENGINE RUNNING BACKWARD.			
FRONT		BACK		FRONT		BACK	
H. P.	L. P.	H. P.	L. P.	H. P.	L. P.	H. P.	L. P.
6	13	6⅛	13⅛	6	6⅞	5⅞	7¼
8	15⅛	8⅞	15⅝	8	9¼	8⅞	9½
10	16⅜	11⅝	17	10	11	10⅝	11½
12	17 9/16	13½	18	12	12⅞	12½	13½
14	19	15⅜	19½	14	14⅜	14⅜	15⅛
16	20 3/16	17	20½	16	16⅛	16¾	16½
18	21¼	18¾	21½	18	18	18½	18½
20	22 9/16	20⅝	22 11/16	20	19	19⅞	19⅜
20¾	22⅝	21 1/16	22⅞	20½	20⅛	20½	20⅛
Full Stroke							

The low pressure pistons move slowest in the last part of the stroke and the high pressure pistons move slowest in the first part of the stroke. This causes the valve to cut off sooner the first half of the stroke in the high pressure cylinder, the reverse lever being in any notch from four to twelve inches.

The strain on the crank pin is greatly reduced, since the low pressure piston passes the center first, and at a reduced speed on the last half of the stroke. There is no more strain on piston rods nor wear on piston heads or cylinder than on those of a simple engine, the piston rods being in line with their respective wrist pins. This form of connection works steam to excellent advantage, as will be observed by examining the accompanying table, showing points of cut-off.

Decline of the Brotherhoods.

Published reports have this to say about the falling off of membership of the various organizations of railroad employees during the last year:

Since January, 1894, 131 lodges of the Brotherhood of Locomotive Firemen have become defunct. This means a falling off in membership of over 4,000, to say nothing of individuals who have withdrawn everywhere throughout the country. The International Trackmen's Union is dead, and the Switchmen's Mutual Aid Association is little more than a nominal organization. Grand Master Miles Barrett has secured a job, and is now switching cars in the yards at Kansas City. The Brotherhood of Railway Carmen has gone to pieces. John Bowie, head of the Trackmen's Union at Battle Creek, Mich., has been as inactive as the Grand Master of the Carmen. The same sad story may be told of the Order of Railway Telegraphers. Not over 5,000 members are now in good standing, and many lodges have surrendered their charters. Ex-Grand Chief Thurston is practicing law at Lathrop, Ia., and Ramsay is following the same profession in Chicago. Between November, 1893, and the present time the Brotherhood of Locomotive Engineers has lost over 8,000 members. This is partially due to hard times. Several charters have been surrendered, and the membership is on the decline. There is war between the Eastern and Western engineers over the Grand Chief, who has for years been objectionable to the Western men. In the ranks of the Brotherhood of Railway Trainmen, 145 lodges have become defunct within the year, and returned their charters. This means a loss in membership of nearly 4,000 besides the withdrawals from lodges which are still in good condition. The Trainmen's Journal is the only official organ of any organization named that has had the honesty to strike the names of defunct lodges from the directory which is published monthly. The Order of Railway Conductors has suffered a proportionate loss.

The *Journal* of the engineers' brotherhood denies the above statement in reference to that organization, saying that its membership is now about 34,000, and within 1,000 of the usual number.

A Problem in Steam Heating.

A priest who requested a donation from his congregation to defray the cost of coal for heating the church, noticed that all of his flock but one contributed toward the donation. Meeting the delinquent after service, the priest took him to task for his conduct. "Now, Tim, why didn't you give something, if only a penny?" "Faith, father, I'm onto yez." "Tim!" "Yes, father." "What do you mean?" "Oh, nothing, father. Just that I'm onto yez; that's all." "Tim, your words are disrespectful and require an explanation. What do you mean?" "Oh, faith, father, a-thryin' to pull the wool over mi eyes. A-thryin' to make us believe yez wants the money to buy coal to heat the church, and yer reverence knows it's heated by steam."

Freight and Passenger Revenues of Railroads.

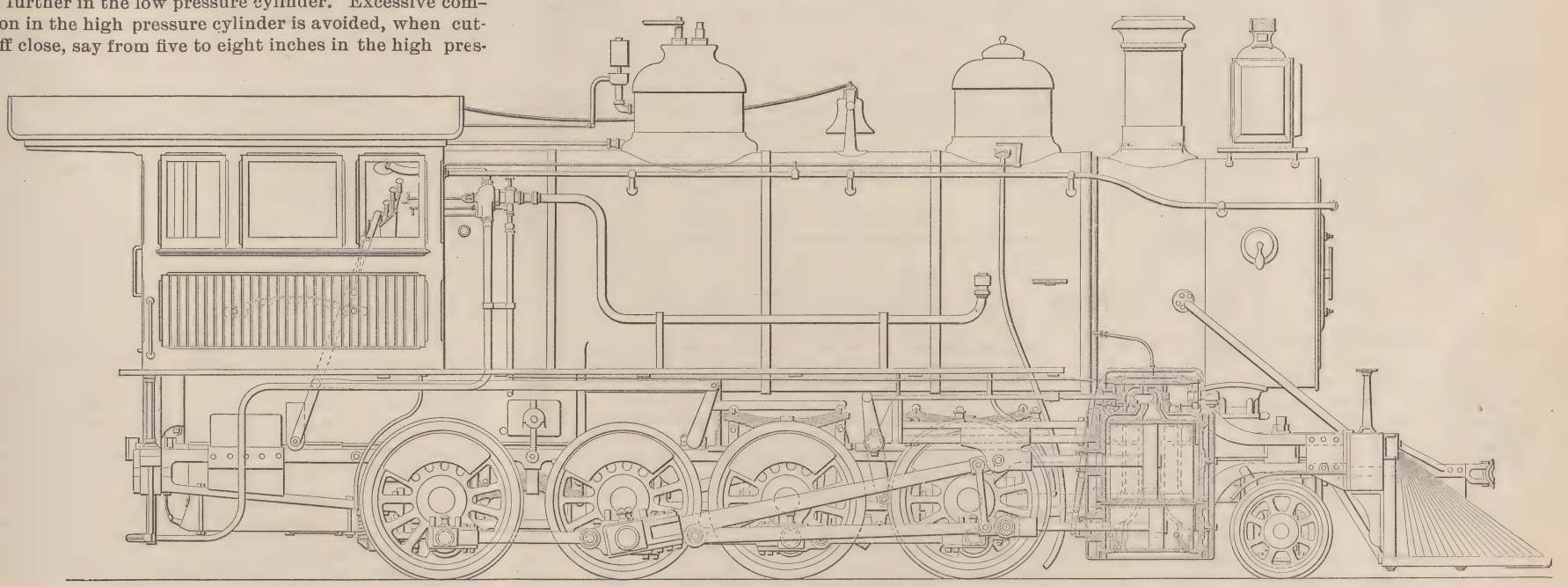
There are few railroads in this country which derive as much revenue from their passenger as from their freight business. All such roads have a New York terminus, and prominent among them are the New York & New Haven and the Long Island. But, generally speaking, the freight traffic is the backbone of railroad business and the chief dependence of owners and managers. The Erie Railway, for instance, does a large amount of commutation and excursion business, which has been developed assiduously for more than 20 years. Yet the entire passenger earnings of the road for 1893 were $5,000,000, against $7,000,000 derived from freight traffic, and that, too, in the yea of the World's Fair, when the Erie, like other trunk line between the Atlantic seaboard and Chicago, had an unusual amount of passenger travel.

This proportion between passenger and freight earnings is about the average among American railroads. In respect to freight earnings, the Pennsylvania Railroad stands at the head, with an annual revenue from this source of $35,000,000. The New York Central comes next, with $30,000,000, and then following in the order named (taking the figures for 1893) the Southern Pacific, $29,000,000: Atchison, Topeka & Santa Fe, $28,000,000; Chicago & Northwestern, $26,000,000; St. Paul, $25,000,000; Chicago, Burlington & Quincy, $19,000,000.

The enormous freight business of American railroads is peculiar to them. The United States is, practically, the only country in which the freight tonnage exceeds the number of passengers carried. In France, according to a late report, the revenue from passengers exceeded that from freight in the proportion of two to one. It is even larger in England. In Germany the proportion of passenger traffic to freight traffic is four to three. In Italy the proportion is three to one; in Spain and Switzerland it is four to one.

Old Railroad Iron.

In speaking of the uses of old rails recently, a well-known official of the Pennsylvania Railroad said: "The life of a rail on the Pennsylvania lines West is about eleven years, and on the Pennsylvania Railroad only nine years. The difference is perhaps due to heavier traffic on the Pennsylvania Railraad. The friction of constantly passing trains wears on the rail until it must be replaced by a new one. The company pays $24 per ton, and the rails used on our line average 85 pounds to the yard. When it has passed its useful stage the rail is replaced. The old rails that are taken out from time to time are gathered up every month, and sold to junk and scrap dealers at $12 per ton. It can readily be seen that the company pays only $12 for the use of rails per ton. The price received from the scrap man is a good figure, when it is known that the rails, when sold, are of no use to the company. Rails that are not much worn are sold to factories along the road at $18 per ton, where they are used for sidings, and answer the purpose quite as well as new rails. There are many uses to which the old rail is put. A great amount of barb-wire fencing is made of railroad iron, and very often the rails are used as foundations for large buildings. There are not many people who know that the Masonic Temple in Chicago rests on a foundation of steel rails, layer upon layer, six feet deep.



Dunbar's Compound Locomotive.

"Dear me!" cried the nurse; "the baby has swallowed my railway ticket. What shall I do?" "Go and buy an other right away," returned the mother. "I am not going to let the conductor punch the baby."

The difference between nominal, indicated and effective horse-power often puzzles people. Nominal horse-power is an assumed quantity, used for the convenience of makers and buyers in describing the dimensions of the engines. Indicated horse-power is the amount shown by computations of the indicator diagram. Effective, or actual, horse-power is the work an engine can do.

The Union Pacific has abandoned its dining-car service between Omaha and Evanston, and has resumed the use of its eating-houses.

"They say it is electricity," said "Pat," as he stopped before the incandescest street light, "but I'll be hanged if I see how it is they make the hairpin burn in the botthle."

It is stated that the Pennsylvania Railroad is feeling the competition of trolley lines to near-by suburban points to such an extent that the subject of reducing rates or withdrawing trains is being seriously considered.

Communications.

Explosion of a Baker Heater.

Editor National Car and Locomotive Builder:

The recent explosion of an alleged Baker car heater in a New York Central Railroad pay car, having been pretty generally noticed in the New York newspapers, I deem it important enough to warrant a word of explanation on this subject, as it will doubtless interest nearly all if not every railroad company, as all have the Baker heater either themselves or with connecting lines.

I personally inquired at the New York Central depot as to the particulars of the accident, but was informed that nothing was known further than the fact of the explosion, as the man sleeping in the car was the only one who could relate the particulars, and he was too ill to be interviewed. The writer, however, knowing his own children well, can with certainty say that, although the heater might have been intended for a *genuine* Baker heater, the very fact of its exploding is proof positive that it was *not* in every sense a Baker heater, for, if it had been, explosion would have been impossible.

The heater was in one or the other of the following-named conditions, which conditions are utterly foreign to a modern Baker car heater. The liquid within it, intended for circulation, was either frozen or *too low* in the circulating drum (the portion and the only portion of the heater that could explode to cause damage.) If the water is too low, an excessive and often a *bursting* pressure will be created, but with the frangible safety vent belonging to all modern Baker heaters, the vent would surely have burst instead of the drum, which in this and every similar instance is the only portion of the heater that can possibly explode to do damage—this from the fact that it is the only part that has an extent of surface sufficiently large for the accumulation of any dangerous pressure.

Without the circulating liquid being brine, to prevent its freezing, and a safety vent on the top of the drum, whose disk is thin and frangible enough to break and relieve any pressure within the heater that is at all of a dangerous accumulation, the heater is not a Baker heater. Without the water being *saturated* with salt, the heater is not a "Baker."

A genuine modern Baker car heater—not a *part* of a heater—has never been known, among the 30,000 now in use, to have ever bursted or in any other way to have injured any person or itself. These facts are well attested by every railroader in the country—or the world—who is at all conversant with the Baker car heater and its proper management. Respectfully yours, WILLIAM C. BAKER.

NEW YORK, February 15.

Turn the Hose on Mobs.

The recent rioting in Brooklyn during the great street car strike there has brought out the suggestion from a railroad man to use fire hose instead of bullets in dispersing mobs, and in support of this method he related his experience a dozen years ago in dealing with a mob in Central New York. Two railway companies claimed ownership in certain water rights. One company was in possession of a dam. The other company wanted possession and sent an unorganized gang of men to take possession forcibly. The effective weapon of defense by the party in possession was a fireman's hose filled with water at high pressure. It was more effective than grape or canister. Before it the mob melted away, attempted to rally, but finally disappeared. It was a bloodless victory, and therefore all the more notable. Hereafter when riots occur let the mayors of cities call out, not the police, but the fire laddies, and give the order to turn on the hose.

The vestibule for passenger cars is being rapidly adopted on German railroads. Over 20 vestibuled trains are now being run on these roads, and the number is to be doubled shortly.

Application of Freight Car Draft Gear to Locomotive Tenders, C. B. & Q. Railroad.

To simplify repairs and reduce the number of standard designs, the Chicago, Burlington & Quincy Railroad has extended the use of its freight car draft gear to locomotive tenders. With old tenders having a wooden center sill an arrangement is adopted by which the drawhead and draft gear is carried immediately beneath the center sill, which is cut out 2¼ inches on the under side to give needed clearance to the moving parts.

For the purpose of carrying the draft rigging in this case subsills reaching from the end sill back to the transom are bolted beneath the two intermediate sills. The drawbar rigging is carried in this manner by built out wrought iron supports, 1 inch by 6 inches, bent into the shape of an abnormally elongated letter C, each turned up end of which is secured by four bolts to the subsills. The draw-bar stops are forged on to the inside surfaces of these carriers. The stops are drilled to receive the bolts of the draw-bar guides. The iron carriers are formed so as to give the proper clearance for the follower plates, and are of sufficient length to bear at the back end against the end sill to which they transmit the stress which comes upon the draw-bar. No castings are used in this arrangement. It is simple in construction, has few parts and is conveniently arranged for making repairs. It has given excellent satisfaction.

The desire to extend th euse of this draft arrangement to all locomotive tenders and to make its application as simple as to freight cars, the tenders of new class H engines (moguls, 19 inches by 24 inches) are given steel center sills, as illustrated in the accompanying engravings. These sills are composed of two 12-inch channels with backs together, extending the full length of the tender and weighing 24 pounds per foot. Fig. 1 shows a plan of the sills and of the wrought iron attachment of the draft rigging.

Figs. 2 and 3 show end and side elevations of the draft rigging, and the drawbar carrier iron.

Fig. 4 shows a sectional view of the sills and the method of attachment to the body bolster, which is identical with that used on freight cars. Figs. 5 and 6 show front drawbar arrangement, and attachment to the steel center sills.

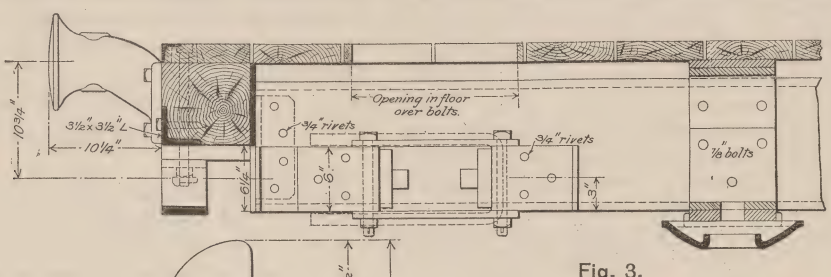


Fig. 3.

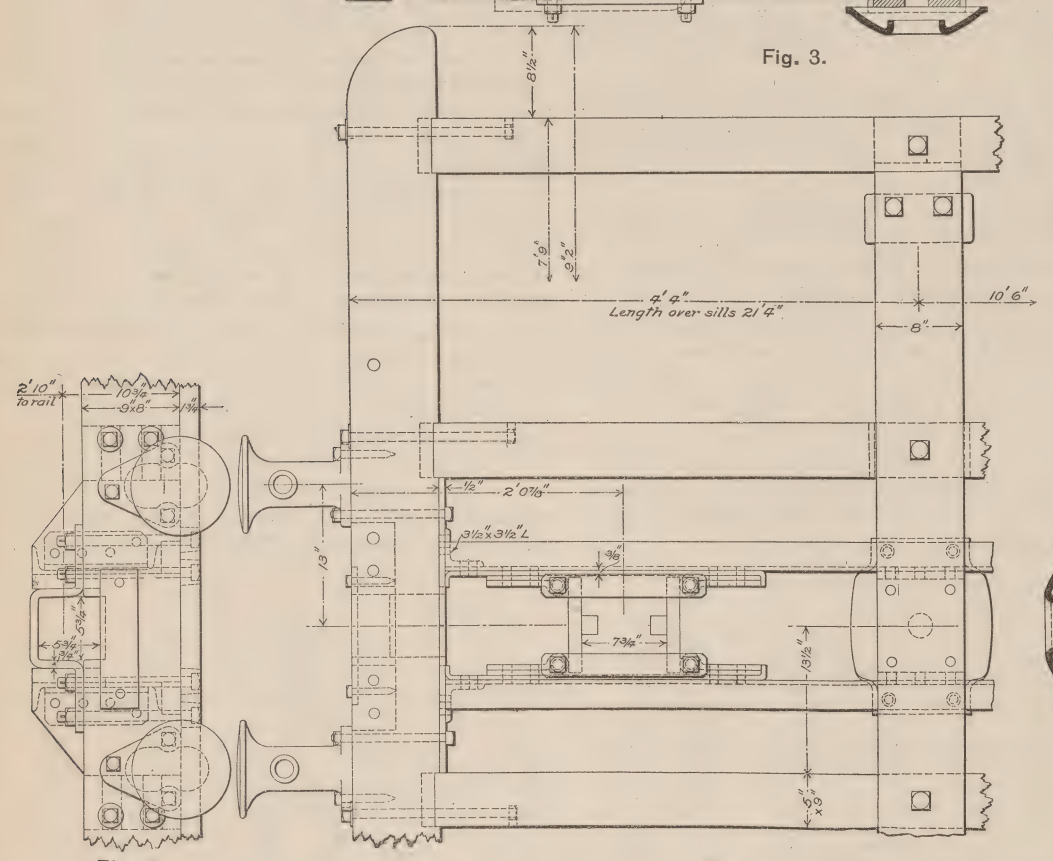


Fig. 2.

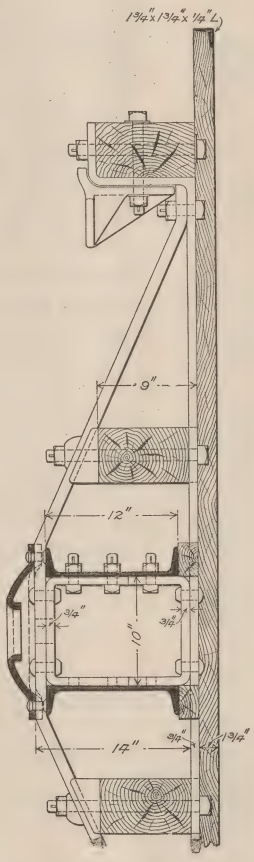


Fig. 1.

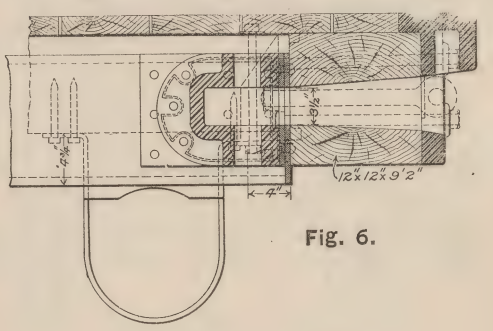


Fig. 6.

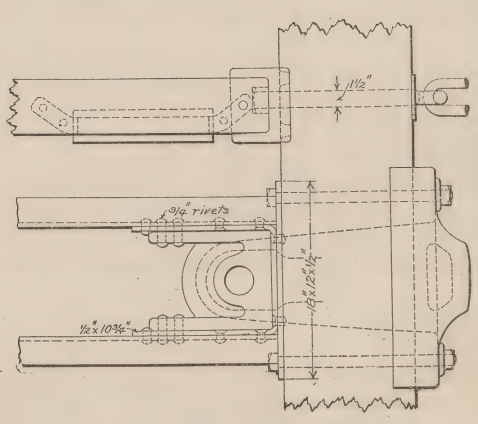


Fig. 5.

Application of Steel Center Sills to Locomotive Tenders, Chicago, Burlington & Quincy R. R.

A railroad, the terminus of which will be on the summit of Mont Blanc, Switzerland, is projected by some European engineers and capitalists, according to *Genie Civil*. It is planned to have the line start from the ravine of Miages, near the watering place of St. Gervais, and enter immediately a tunnel four and a half miles long; at the end of that tunnel a vertical well nearly one and three-quarter miles in length would be pierced, and an elevator would take up the passengers to the summit. It is calculated that it would take 10 years and 10,000,000 francs to execute the work.

The California State Mineralogist's report shows that during 1893 California more than doubled the silver output of the previous year, producing $537,155, as against $262,550 in 1892. The gold output was practically the same in both years.

In India last year the number of deaths from snake bites numbered 21,000, and in reprisal 120,000 venomous reptiles were slain. The destruction of human life by all other animals was 2,800, of which tigers were responsible for 1,000, leopards 291, wolves 175, bears 121 and elephants 68. Ninety thousand cattle were destroyed by wild beasts, an increase of 9,000 over the preceding year. The Indian Government gives bounties for the destruction of venomous reptiles and predatory beasts, but not enough to keep the supply from greatly exceeding the demand.

Accidents to Locomotive Engineers and Firemen in 1894.

The "American Engineer and Railroad Journal" publishes in its last issue a *resumé* of the accidents on the railroads of the United States that resulted in the injury or death of the men on the engines. We quote as follows from the account:

"Upon examination we find that, during 1894, 134 engineers and 103 firemen were killed, and that 220 engineers and 176 firemen were injured in the 399 accidents that have happened. By referring to the April, 1894, issue of this paper the reader will see that during the preceding 12 months there were 450 accidents, in which 108 engineers and 114 firemen lost their lives and that 251 engineers and 223 firemen were injured. This means that there has been a falling off of something more than 11 per cent. in the total number of accidents, and that the rate of death and injuries has risen 6¾ per cent. and fallen 1⅝ per cent. respectively; which, being interpreted, may be made to mean that while the total number of accidents have fallen off they have been individually more serious, and that therefore it would appear that the cutting down of expenses and the crippling of the service has resulted not only in increasing the number of accidents per train mile, but has tended to make those accidents that do occur more disastrous than they would have been under normal conditions. The following is a list of the accidents for 1894 in which an engineer or fireman was killed or injured:

Blowing out of cylinder head	2	Misplaced switches	27
" " plug	1	Obstructions on track	6
Boarding train in motion	1	Open drawbridge	1
Boiler explosions	15	Overturning of engine	1
Break in two	1	Rails spreading	3
Broken axle	1	Repairing grates	1
" connecting rods	2	Runaway engines	1
" rails	5	" trains	5
" side rods	5	Running into hand-car	2
" tires	1	" " off float	1
" trucks	2	Run over	8
Burned bridges	1	Stone-throwing	2
Bursting arch pipe	1	Strikers	6
" gage glass	4	Struck by ash-pan lever	1
Cars blown on track	2	" " car on siding	2
Cattle on track	19	" " engine	2
Caught between cars	5	" " obstruction	8
Cave in	1	" " train	2
Collisions	116	Suffocated by snow	1
Crushed under engine	1	Suicide	1
Cut in cab window	1	Thrown from engine	2
Defective air brake	1	Train burned	1
" bridges	7	" robbers	3
Derailments	36	" wrecking	26
Falling from engine	10	Trestle burned	3
Flying reverse lever	1	Tubes bursting	8
Forest fires	2	Unknown	11
Gas explosion	1	Washout	5
Jumping from engine	5		
Landslides	14	Total	399

"Referring to this list we find that collisions are by far the most prolific sources of danger, there having been 116 during the year; next comes derailments, at 36; misplaced switches, 27; train-wrecking, 26; cattle on the track, 19; boiler explosions, 15; landslides, 14, and those attributed to unknown causes, 11."

The Maine Central Railroad, to meet the exigencies of present business, has recently purchased of the Schenectady Locomotive Works 20 new locomotives, to replace 15 old engines sold to the same concern. The old locomotives were all of too light construction to economically handle the present traffic of this road. The new engines are of three classes. Three are six-wheeled switch engines of the following dimensions: Cylinders, 18 by 24 inches; drivers, 44 inches; weight on drivers, 90,000 pounds. Five are eight-wheeled passenger locomotives of the following dimensions: Cylinders, 19 by 24; drivers, 62 inches: weight on drivers, 72,000 pounds; total weight, 111,800 pounds. Twelve are mogul freight engines of the following dimensions: Cylinders, 19 by 26 inches; drivers, 56 inches; weight on drivers, 99,700 pounds; total weight, 115,800 pounds.

On account of the sickness of one of the jurors, the Debs conspiracy trial has been postponed to the first Monday in May.

Economy in the Use of Coal by Railroads.*

BY S. P. BUSH.

In presenting this paper it is the object of the writer to indicate or suggest a field of inquiry in this very important matter of coal consumption, which to some may no doubt have been a matter of long consideration, but to others somewhat fruitful. As a rule, the fuel or coal account of railways is the largest single item of expense with the exception of labor. It is not uncommon for this expense during the period of a year to reach a sum that must be expressed in six or seven figures, and this being the case a saving of five, ten or fifteen per cent. would be most desirable; and the assurance can safely be given that such savings are entirely possible in the majority of cases at least. The economical use of fuel is generally the responsibility of the mechanical department of railways, and that much has been accomplished it is needless to say. The great value and necessity of making proper selection of coals to be used was shown in the very able paper presented to this Club at its last meeting by Mr. Wm. Forsyth, of the C. B. & Q. R. R.

The matter of improving the device which converts the coal into useful energy has received most careful attention for a long time, and it would be difficult to see how a thoroughly modern locomotive could be improved to the extent of increasing its efficiency ten or even five per cent. From a purely mechanical standpoint, therefore, the matter has been very thoroughly considered. But, besides the efficiency of the coal and the engine, there is another factor, viz., the efficiency of the men who handle the coal and operate the engine, which we are often apt to lose sight of and to which your attention is invited in this paper.

Almost everyone who has the care of locomotives, or locomotive performance, has no doubt at sometime observed that in every day practice much waste of coal takes place through the lack of careful attention or knowledge on the part of engineers and firemen. The sources of waste are too numerous here to mention, but the assertion is made with perfect confidence that in most cases it amounts to 15 per cent. of the total consumed. Various measures have been adopted to prevent this. Some roads have a traveling engineer or road foreman of engines whose duty it is to instruct the men and supervise their performance by riding with them occasionally, and no doubt a fair average standard is thus effected. But it is impossible for him to be with them every day or every week, and when the restraint of his presence has been removed the men drift back to their average work, which, I think will be generally conceded, does not constantly contemplate economy. The average education and discipline of enginemen is hardly calculated to bring forth their best efforts. There is a vast difference in the performance of different men, and also a great difference between the present performance of the best, and that attainable. The writer has had occasion to give this matter attention for sometime past, and from carefully kept records of the daily performance of over 1,000 enginemen in the matter of fuel consumption, it has been found that the average is fully 15 per cent. below the best, and in some individual cases is as much as 40 per cent. below the best. It has been found that the best can easily maintain a standard 10 per cent. higher.

The question is naturally asked how this saving can best be effected and the standard permanently raised. In short, it may be answered by saying: Education and discipline and by enlisting the hearty co-operation of the enginemen.

First.—It is necessary to keep accurate records of each man's work, which can be used as a constant check instead of something occasional.

Second.—Establish fair standards of what should be done

Third.—Offer some inducement to the men for improving their work, something which will enlist their energies and ingenuity willingly rather than in a compulsory manner, for it must be admitted that volunteer work is much more effective than compulsory or hired work.

Fourth.—Let every man see what he and his fellows are doing by posting in proper places monthly reports.

As to the first essential, it may seem impossible in some cases, but if the effort is earnestly made it will not be found even difficult. It is a simple matter to weigh or measure the amount of coal that is put on locomotive tenders. The amount left at the end of a run is also attainable by measurement if it is made level with the top of the coal space of the tank. A measuring strip secured to the side of coal space at half the height and running its entire length will be found convenient for this and quite as accurate as weighing.

As to the second essential, with proper records of the average requirements of the different classes of grades of work to be done, it is a simple matter to set the standards. These would be expressed as pounds of coal per car mile, or ton mile, after first deducting a quantity which an engine alone would require. This latter deduction is necessary on account of the necessity of having the standard or rate per car independent of the number of cars hauled. Different rates will, of course, have to be established as the work per car is greater or less.

As to the third essential, and by no means the least, there should be a thorough understanding among the men that their future with the company depends largely on their good performance and desire to improve. Is there any reason why an engineer or fireman who cannot or will not reach a fair standard shall receive as much remuneration as his fellows or be maintained in the service? Certainly no more than is the case in any other branch of the service, yet in the case of enginemen there seems to be a notable exception. Again, it is perfectly right that those who rise above the standard, those who render better service, should receive more additional compensation, and this can be given in the way of some part of the saving they have effected, for instance, one-fourth to the engineer and one-fourth to the fireman, leaving one-half to the company.

For the fourth essential it was stated that the records of the men should be made public. The influence that this exerts is considerable. It becomes a matter of much pride on the part of some of the men to see that success has attended their efforts, and that the knowledge of certain things which they have endeavored to attain results in such a way as to advance their relative standing. To many of those who have not done well it is a matter of much regret and leads to inquiry as to the cause, a sharpening of the wits and increased effort at improvement. There are some who will be found to require considerable pressure to move them, and a few who perhaps would feel neither pride nor regret. It is an easy matter to discover these, and there is no reason for retaining them.

To give some idea, it may be well to outline somewhat further the manner of collecting the information for the record. Each engine is provided with a coal book of coupons and stubs. Upon arrival at the end of the run the coal remaining is ascertained as already indicated, and this with the additional coal given is entered on the first stub. If more is taken by the crew on the run out it is also entered on the stub and on one of the coupons, which latter is removed and given to the man in charge of the coaling station where the coal is received. At the end of the run one of the hostlers, or coal wharf men, takes the measurement of that which is left and enters this also on the stub. He fills out the last coupon showing the total coal received by the crew and that remaining, receives the signature of engineer with train number and detaches the coupon, which is forwarded to the proper place. The coal left on the tender being shown on the stub and a known quantity being added and also entered, the next crew taking the engine know how much they start with. It is here supposed that the same crew does not always have the same engine, but this makes no difference.

This system, in short, contemplates a constant and effective stimulus for maintaining a standard in keeping with the efforts that have been made in other directions looking toward economy in fuel. All coupons are forwarded to the same point, and at the end of the month are worked up in connection with the car and engine mileage for the monthly report which shows the performance of each man.

It is impossible to show here the influence that such a system can be made to exert except to state the general result in the way of saving (which has already been put at 15 per cent.) to the railway company. The ways and means that the men find for effecting this are innumerable. Waste at the safety valve is stopped, steam is used expansively, there is more careful firing and less smoke, unnecessary movement or stoppage of trains is avoided, and many ingenious methods are resorted to that men will find and carry out only when prompted by voluntary impulses.

Some objections may be urged against such a system; for instance, it may be said that engineers will not make time with trains. Of this it need only be said that if such should be the case it could be very easily checked up; but such is not likely to occur for the reason that the necessity for making time in running trains is so thoroughly understood as to render any letting up in this respect almost impossible. It may be argued that the principle of paying for endeavor above the average is not correct—that a man is paid for doing his best work all the time. Of this it may be said that the principle of exact payment for services rendered would seem to be entirely right and much better than throwing a lot of men together in one class and placing all on the same level. It is certainly right and better to pay each individual in proportion to his worth. It may not be entirely within the jurisdiction of the mechanical department of all railways to inaugurate such measures for economy, but under any circumstances it would be entirely within its province to suggest it, and to co-operate in carrying it out. This department, as stated before, is usually accountable for economical coal consumption, and it would seem entirely right for it to present any device by which a saving may be effected. If the will and energy of 100 or 1,000 men can be enlisted for the accomplishment of some purpose, the force is certainly a powerful one, and there is no doubt but that something must be accomplished.

Most all railways keep careful records of car wheels and axles, and keep a careful check of most all materials used and their performance. Why then should not the very large use of fuel be carefully checked, as of more importance than all the performance of employees to whom is intrusted the use of valuable materials.

It is thought that it is not unreasonable to conclude that this very important matter is often overlooked, and that while we are attempting to improve in some directions, we are losing more in others. It may be stated here also that there are many indirect advantages that will come from the more careful operation of locomotives as above indicated. Engines will give better service generally, and the frequent complaint of no steam and leaky flues will be much abated.

*Read to the January meeting of the Western Railway Club.

Chestnuts.

[The following jokes, which are veritable "chestnuts," are reproduced from the first two volumes of THE CAR BUILDER, published 25 years ago, and 24 years ago, respectively. They are old enough now to be new—to the "present generation," and most of them are good enough to bear reading again by our oldest subscribers.—ED.].

Table of Interest.—The dinner-table.

A capital letter—One containing a remittance.

Barnum's armless woman is said to write a very good foot.

The "embers" of the dying year—September, November and December.

A Middleboro rustic "set" his watch by the gage in a locomotive cab.

A wholesale house advertises: "Wanted women to sell on commission."

A man who inadvertently seated himself upon a lot of carpet nails said they reminded him of the income tax.

The man who by mistake took a drink from a bottle of mucilage says that he has felt "stuck up" ever since.

A little girl sent out to hunt eggs came back unsuccessful, complaining that "lots of hens were standing around doing nothing."

A grocer complained to for selling bad eggs, said: "During the summer months hens are unwell and frequently lay bad eggs."

A man named John Hole was so lazy that, in writing his name, he simply used the letter J. and then punched a hole through the paper.

"You need a little sun and air," said a physician to a maiden patient. "If I do," was the reply, "I'll have to wait till I get a husband."

"Young man, do you believe in a future state?" "You bet, and what's more, I'm goin' to enter one as soon as Betsy gits her things ready."

An independent Missouri girl set out to earn her own living as a telegraph operator, and in two years accumulated $200,000. It was left her by a rich uncle.

Punch says that a Yankee baby will crawl out of his cradle, take a survey of it, invent an improvement, and apply for a patent before he is six months old.

A little boy, after thinking for a long time, said to his mother: "I don't see how the devil came to turn out so when there was no other devil to put him up to it."

With four metallic qualifications a man may be pretty sure of success in the world. There are gold in his pocket, silver in his tongue, brass in his face, and iron in his heart.

An eccentric clergyman lately said, in one of his sermons, that "about the commonest proof that we have that a man is made of clay is the brick so often found in his hat."

An Irishman, fresh from the sod, and anxious to secure a humming-bird, caught a large bee instead; it stung him, and he cried out. "Houly Moses! how hot his little fut is!"

"Look not on the wine when it is red!"
"I don't," said a wicked fellow.
"For I drink Jersey lightning now,
And that is a dirty yellow."

An old darkey down South says: "Dey tell us dar war pervisions in de Constitution for colored folks, but dat was a lie—dem pervisions didn't come—I ain't seen the first mouthful."

An exchange says, that "an Irishman who was recently run over by a whole train of cars got up and asked for his cap, and said he would not run such another risk as that for tin dollars."

A Western editor, who doesn't know much about farming any way, suggests that for garden making a cast-iron back, with a hinge in it, would be an improvement on the spinal column now in use.

A country editor, living on the line of a railroad, applied for a pass for himself and added, "Please embrace my wife." The superintendent returned a pass to the editor, but declined the proposed honor.

An individual who was puzzled to know where all the Smiths came from has at last solved the mystery. At Waterbury, Conn., on the door of a factory appears a sign inscribed, "Smith Manufacturing Company."

A man from the country, whose wife had eloped and carried off the feather-bed, was in search of them; not that he cared anything about his wife, "but the feathers," said he, "them's worth forty-eight cents a pound."

A good-natured traveler fell asleep in a train a short time ago, and was carried a few miles beyond his destination. "A pretty good joke, isn't it?" said a fellow-passenger. "Yes, but a little too far-fetched," was the rejoinder.

The other day a tobacconist at Cleveland hung in front of his shop the following notice, written on a board: "Wanted—A Girl to Strip." A special meeting of the woman's rights society was immediately called to investigate the case.

"Are you not alarmed at the approach of the King of Terrors?" said a minister to a sick man.

"Oh, no! I have been living six-and-thirty years with the queen of terrors—the king cannot be much worse!"

A street-car dummy has been so arranged that the engine consumes its own smoke and steam. It is not the first motive-power on street railroads that has been self-consuming. Some roads employ horses that will eat themselves up in six months.

"Look here, Pete," said a knowing darkey to his companion, "don't stan' on de railroad."

"Why, Joe?"

"Kase, ef de cars see dat mouf of yourn dey will tink it am de depo' and run rite in!"

An unsophisticated Norwegian in Northern Iowa put a pound of gunpowder in his coat-tail pocket the other day, and after taking a hearty smoke put his pipe on the top of the powder. Although it did not quite kill him, he has a sweetheart who mourns over his *awful end.*

A western paper reports the water so low in the Mississippi river that steamboats have to keep whistling to keep cows out of the channel; many captains are having cow-catchers put on the boats. This is about the thinnest river yet discovered. They will have to melt ice pretty soon.

"Mister Crow, what am your 'pinion of Sam Toby's character for honesty?" "Wal, as for Sam, I don't know nothing about him. Some says he's honest, and it may be so. I don't say he ain't honest. But this I does say: If I war a chicken, and Sam was about the yard, dis niggah would *roost high*, he would."

"As I was going over the bridge the other day," said a native of Erin, "I met Pat Hewins. 'Hewins,' says I, 'how are you?' 'Pretty well, thank you, Donnelly,' says he. 'Donnelly?' says I. 'that's not my name.' 'Faith, then, no more is mine Hewins.' So with that we looked at aich other agin, an' sure enough, it was nayther of us."

A dissipated young man, who ran away from home and spent his substance in riotous living, resolved at last to return to the parental roof. His father was kind enough to forgive the young rascal for his wickedness, and rushing into the house, overcome with joy that the boy had returned, cried out to his wife, "Let us kill the prodigal; the calf has returned!"

A gentleman who had taken his seat in the Boston & Maine train for Portland, a few days since, was suddenly impressed that something would happen to the train he was on board of. So strong did his feelings take hold of him, that he left the cars and hastened to the Eastern depot, and took the train there, which came through all safe. So did the other train.

A Kansas girl was standing hand in hand with her lover, with eyes and mouth agape, watching the incoming of the first train on a new railroad. The locomotive was quiet until it came into the depot; but when the whistle blew, as the engine was stopping, the girl burst out with the exclamation, "*Why dog my cat, if she didn't come plum into the shanty afore she bellered!*"

"Good Heaven!" said an astonished greenhorn at the President's levee, calling the attention of his more experienced friend to the amazingly low-bosomed dresses worn by the fashionable ladies present, "did you *ever* see the like of *that?*"

"I think not," was the calm and considerate reply, "at least not since I was *weaned.*"

"You see, grandmamma, we perforated an aperture in the apex, and a corresponding aperture at the base; and by applying the egg to the lips and forcibly inhaling the breath, the shell is entirely discharged of its contents." "Bless my soul!" cried the old lady, "what wonderful improvements they do make! Now, in my younger days, we just made a hole in each end and sucked."

Two San Francisco barbers engaged to fight a duel, agreed to part and walk around a block, and when they got in sight of each other to blaze away. When they turned the corner out of sight, both started on a run in different directions, and one has sent back from Alaska for his winter clothes, and the other has written to his wife from the City of Mexico, asking her to send his linen hat and palmleaf coat.

A lady inquired of the spirit-rapper how many children she had. "Four," rapped the spirit. The husband, startled at the accuracy of the reply, stepped up and inquired: "How many children have I?" "Two!" answered the rapping medium. The husband and wife looked at each other with an odd smile on their faces for a moment, and then retired non-believers. There had been a mistake made *somewhere.*

Owed to Lake Ontary.

"Green ar' thy waters, green as bottle-glass—
Behold 'em strecht thar!
Fine muskalonges and Oswego bass
Is oft'n katched thar.
Thar the red Injin once took his delights,
Fisht, fit and bled;
Now most of the inhabitants is white,
And nary red!"

Spooner was arrested for drunkenness, and waxed indignant thereat. "Now, I axes," says he, "if it's right to go and arrest a man for supporting the guv'ment. Every drop of licker I swallows is taxed to support the gov'ment. S'pose all us fel's was to stop drinkin'? Why, the guv'ment'd stop. That's the very reason I drinks. I don't like grog; I mortally hates it. If I followed my own inclination, I'd rather drink buttermilk, or ginger-pop, or soda. But I lickers for the good of my country, and to set an example of virtuous resignation to the rising generation."

A Strong Pull.

The Baltimore *American* publishes the following account of the performance of George S. Spriggs, a mechanic employed in the Mount Clare shops of the Baltimore & Ohio Railroad, whose friends think he is about the nearest approach to a locomotive that exists on two legs, and they are probably not far wrong:

"Unaided, he moved for several feet up a slight incline of track a freight car which, with its contents, weighed 55,000 pounds. This is thought to be at the world's record, as the heaviest car known to have been previously moved by single man power weighed, with its contents, 35,000 pounds. This occurred in San Francisco, Cal., several years ago. Last night a little knot of interested persons gathered at the Mount Clare shops. Spriggs' first attempt was a freight car weighing, with contents, 42,000 pounds. This he moved eight feet, and it seemed easy. Then he waited a short time to gather his strength and went for a huge car of the record-breaking weight. He strained and tugged, finally starting it and moving it the required eight feet."

How the Public Is Educated.

We hear a good deal about the influence of the daily press as a public educator, and when there is a gathering of the editors of such papers we hear more about the "moulders of public opinion" and the "leaders of thought," and other sickening self-laudations until one might come to think that nobody but editors knew anything, or certainly that the general public knows very little about anything and has few opinions until informed and instructed by these persons.

A conceited ass of this stripe undertakes to tell the public all about railroading in the columns of a New York daily, and informs the readers that little progress has been made in increasing train speeds on American railroads, and that what is needed for faster traveling is a "reconstruction of the tracks and engine wheels," and the adoption of some plan that will "reduce to the absolute minimum the effects of the back stroke of the piston and connecting rods." He babbles on in this fashion :

In 1866 an average speed of twenty-eight miles an hour was recorded between the same cities. It is astonishing, all things considered, how little progress the railroads have made in speed. The progress is so small, comparatively, that one familiar with the facts can not fail to be puzzled or to have suggested to his mind the question whether the system itself is not inherently at fault—whether it was not begun and developed on the wrong lines.

It is an open question whether the railroad has reached the limit of speed consistent with safety. Will it be necessary to modify the shape of the wheels and track? Will the present type of engine or motor have to be changed to one where there will be no power lost in the back stroke of the piston? Will steam give way to electricity or some other force? It is no uncommon thing for a fast express engine to slow down speed in very cold weather, owing to what they call "freezing out the steam."

There is no theoretical doubt that the rails and wheels can be so modified as to make the engine and train stick to the track better and reduce the margin of danger. There is also no doubt, in theory, that an engine could travel much faster if some plan of mechanism could be devised which would do away with or reduce to the absolute minimum the effects of the back stroke of the piston and connecting rods.

Probably this chrysanthemum has views on wheel construction that would be very valuable to the Master Car Builders' Committee on "Mounting New and Second Hand Wheels," and if he will apply to this office we will give him a letter of introduction to the committee that will probably pave the way to the adoption of his "reconstructed" wheels. In the old Newcomen engines there was no loss in the back stroke of the piston, because the steam that shoved the piston up was condensed, and the atmospheric pressure forced the piston back. Perhaps he means that this practice should be re-established ; or does he, after all, mean that the back pressure in the cylinders needs to be reduced?

Making an Ocean Cable.

The firm of Siemens Bros., of Woolwich, London, has constructed no less than eight out of the eleven cables now linking Great Britain and the United States. The methods of manufacturing cables followed by this experienced firm may be considered typical of the best. The first care is to secure the very best materials. The copper wire, which forms the heart and essential part of the cable, must be of the purest metal, since the purer the metal the higher its standard of conductivity will be. The single wires having passed the test for purity and conducting power, eleven similar strands are taken and spun into a slender rope in lengths of one mile. Gutta percha insulation is then applied in sheets prepared from the raw material as it comes to hand from Singapore and other Malay ports. These sheets are wrapped by experienced hands firmly and smoothly round the wire. The "core" is then ready to be submitted to a galvanometer test to ascertain whether the insulation is perfect, or as nearly perfect as that very elusive agent, electricity, will permit. That test having been satisfactorily passed, a workman, whose sole business it is to tend to the joining of the lengths of cable, splices the ends of the mile lengths. Again the insulation test is applied. The galvanometer indicating no very appreciable loss of electrity, even under the strain of an alternating current of 5,000 volts, the core is passed into the hands of the sheathers, whose care it is to surround the copper and gutta percha with a more substantial protective covering before they are submitted to the rough action of the sea. The weight and size of the cable has now become considerable. Already each mile length has in it some 500 pounds of pure copper and 340 pounds of pure gutta percha. Over this is spun a coat of jute yarn weighing nearly 600 pounds to the mile. Then the cable is made the center of a twisted sheath of steel wires averaging more than 4,000 pounds to the mile, and finally a compound of tar is laid over the whole, which brings its own weight of 800 pounds to the mile. After the tar is applied the cable is coiled and left to soak in tanks of water until such time as the cable ship shall be ready to lay it in its last resting place. Such a cable as this is made at the rate of 50 to 55 miles per 24 hours.

A spreading rail wrecked the Atlantic express on the Union Pacific, near Chappell, Neb., Feb. 7. The engine and four cars were overturned. The thermometer was 30 degrees below zero, and the passengers suffered greatly.

Tim and the Bear.

Everybody in the bunkhouse won dered what made Tim the trackwalker, late. He generally got in about 5:30; it was already 6:30 and as the passenger nor Tim had not shown up the boss was looking weary. He sat at the little rickety table making out the men's time and his own monthly reports by the flickering yellow light from a lantern bottom, every once in a while glancing at his watch and saying, "Wonder what keeps Tim." Frenchy, who was trying to patch the knee of his overalls and swearing because the cloth would pucker, suggested a broken rail as the cause of delay, but the boss said it would not take Tim an hour to fix a broken rail so a train could get over it. Big Mike, who lay stretched out on his bunk with his feet over the railing, said maybe a rock came down on the track up in the cañon. Shorty said he would not be surprised if Tim had found a bridge burned out some place. There were five men in the bunkhouse and each had a different opinion as to what detained him. And so time went on, every one expecting to be called out any minute, while the boss sat writing and erasing and swearing at the mistakes, but always wondering what had happened, until at length the whistle of the passenger sounded above the station. Everybody went to the door and windows, and as the train came around the curve above the switch the sparks could be seen flying from the brakeshoes. "The conductor is going to order us out," said the boss, as he looked for his hat, but the train only slowed up at the platform and then pulled out again. In a moment Tim came in, wet from head to foot, minus hat, adze, wrench and flags. "What's the matter, Tim?" "What's the matter?" said everybody as poor Tim, his teeth chattering, rushed up to the stove and began to pull off his shoes and stockings. "Had a terrible hand to hand struggle with a big bear," said Tim, as he began rummaging around in his bunk for dry clothes. The absurdity of the idea of Tim, who was a little, dried up old man not weighing over 110 pounds, fighting a bear of any size was too much for the boys, and every one laughed. "How did you make it?" asked Shorty; but Tim was mad because they laughed, and would not answer, but proceeded to dress and then went to supper. After he went out the boss told the men not to poke fun at him and he would try to get him to tell his bear story when he came back.

Dry clothes and a warm supper put Tim in a better humor and after he got his pipe lit the boss looked up and asked : "When did you meet the bear, Tim?" "Near the ind of the section," said Tim, "close to the old tie camp ; I was coming along about half past three and just afther crossin' that little bridge I heered a nize of somethin' rustlin' in the bushes down at the bottom of the dump, and thinkin' it was a rabbit I fired a rock down into 'em, an' in a second there was a terrible slashin' around in thim bushes and I see a big cinnamon bear come out sneezin' and rubbin' his nose, and then before I rightly come to me sinces the bear seen me an' up the dump he come. Well, sir, I started down the track as tight as I could go, but I hadn't wint two telegraph poles until I looked back an' see the bear still comin' an' gainin' on me every jump, so I dropped the adze and rinch and stretched meself out for all I was worth ; but it was no use, the bear was still gainin' an' I was wonderin' fhat on airth I was goin' to do whin I see the iron pipe under the track near the cut and made for that an' in I wint au' just got into clear when the bear jammed his hed in at the ind ; but he was too big to go in an' he couldn't reach me and so he pawed around and snorted an' bit at the ind of the iron pipe and tried first wan side an' thin the other, but I was safe an' lay there an' panted an' blessed the man that invinted iron pipes.

"Well, I thought the bear would go away after a while, but he didn't, he stayed right there wid his hed in first wan ind of the pipe and then the other, and when he came around to the upper ind I wished I had held on to the rinch so I could hit him a belt over the nose; so after being in ther over two hours I begin gettin' cold an I see somethin' had to be done and I thought I'd try smokin' him out; so I managed to light me pipe an thin I smoked for all I knew how, but the bear still kept his hed in the hole an' I crawled up closer and blowed the smoke right in his face; he snorted a little but wouldn't back out and seemed to be gettin' madder all the time; then when I was nearly froze to death I happened to think of the stick of giant powder in one pocket, an thinks I, 'Now I settle your hash'; so I puts a fuse in the stick of giant and crawls up and threw it right under the bear's head and then touched off the fuse an backed down to the other ind of the pipe. I guess the bear thought I was going to get away for he run across the track to the other ind; thin when I crawled back to get me feet out of his reach he crossed back again an stuck his head an neck in just as the stick wint off." Tim paused here and lighted his pipe again. "What happened then?" said Big Mike. "There was only wan thing could happen," answered Tim. "Widout thinking I had made a big cannon out of the water pipe an whin it went off I was fired out an landed in the middle of the river an was nearly drownded before I knew just where I was at ; but I finally struck the other bank an got out an' went up to the station an' flagged the passenger an' rode home." "What became of the bear?" asked the boss. "After climbing up the bank I looked back," said Tim, "and saw smoke coming out of the lower ind of the pipe and the bear still at the upper ind lookin' in and tryin' to see phat in hell had happened."—Jerry Sullivan, in *Roadmaster and Foreman*.

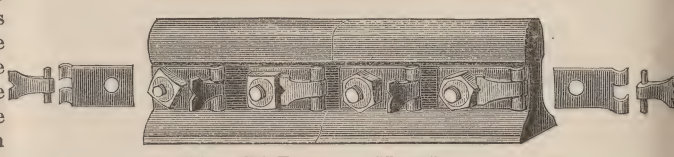
The highest bridge in the world is the Loe River viaduct, on the Antofagasta Railway, in Bolivia, South America. It is erected over the Melo rapids, in the Upper Andes, and between the two sides of a cañon, which is situated 10,000 feet above the level of the Pacific. Counting from the surface of the stream to the level of the rails, this bridge is exactly 636½ feet in height.

Say, Bill, don't go over dere. I once asked der lady fer a chop, an' she showed me de wood pile.

The McDonald Nut-Lock.

There have been many attempts made to invent a reliable and satisfactory nut-lock, but the conspicuous absence of such devices from places where they are most needed indicates that the problem is a hard one to solve, and that failure has generally attained the effort of inventors in this direction. An exception to this rule exists in the McDonald nut lock, an engraving of which appears herewith, showing its construction and easy method of application to track bolts.

The illustration shows that with this device each nut is locked independently of other nuts, and that it can be applied to any nut in any position. The device is very simple in construction, being composed of but two pieces, one of which is an oblong steel washer, about 3⅝ ins. long, and of the exact width of the web of the angle-bar or fishplate. At one end is a circular hole to fit the bolt used. At the other end the washer is hinge-crooked, as shown, so as to hold a movable malleable iron "dog," that, when in position, holds the nut immovable under all conditions, whether it be square or hexagon. The V-shaped slot in the front end of the dog holds the nut in any position when screwed on.



THE MCDONALD NUT-LOCK.

This lock has been severely tested and has proved itself capable of serving as long as the rail. Its use imparts firmness to rail joints, and this, as is well known, contributes to decreased needed repairs of track and of rolling stock. As this lock secures the nut just where it is placed, shorter bolts can be used with it than without it, as no length of bolt is needed to retain the nut when loosened, and bolts will last longer because the connection they make is held solid. Of course there are resulting economies in the needed force to keep the track in order, and it is believed by the manufacturers that this saving of wages alone will more than pay in the first year the entire cost of equipping the track of any road with these locks, while the saving will continue the same each succeeding year during the life of the locks.

The usefulness of these locks is not confined to track work, although we have so far confined our remarks to this field. They are of equal usefulness in car construction, and in fact in all kinds of rolling stock construction where special means are needed to keep nuts from working loose. They are specially adapted for use in truck construction, and for the numerous bolts required in the draft gear of cars.

This useful device is manufactured by the McDonald Nut-Lock Company, of 271 Broadway, New York, of whom further particulars of its operation and merits may be obtained.

Sailor—"I was shipwrecked in mid-ocean and nearly died of thirst."

Landsman—"I gan sympathize mit you. Vonce I vas railroad wrecked in a prohibition State."

Bridget (eagerly)—"Now you're back tell me phat yez saw in Noo Yark."

Pat (gravely)—"Th' ferryboats! bedad, they've got a bow at th' both inds av thim so they kin go both ways at wanst."

The *Evangelist* says that the largest cross in the world now stands in Drake's Bay, North America. Three hundred and fourteen years ago Sir Francis Drake landed in this bay, and his chaplain, Francis Fletcher by name, preached the very first English sermon ever heard in that region. To commemorate this event Bishop Nichols, of California, and the late George W. Childs caused a large stone cross to be erected on the spot, a cliff standing 300 feet above the sea. The cross is 57 feet high, of blue sandstone ; several of the stones in it are larger than the largest stone in the pyramid of Cheops.

Speaking of Russian railroad travel, a recent tourist writes that "Although berths had been engaged in St. Petersburg a week in advance, all of the passengers in the sleeping-car were turned out just before the train left St. Petersburg last evening, in order that the car might be occupied by a Russian grand duke, who was on his way to Warsaw."

Science.—"Father," said Danny Grogan, "why do they have the electric-light wires covered with rubber?" "Oi am soorprised at your ignorance," said Mr. Grogan in answer. "They do be covered so thot the light cannot lake out av um."

Chicago.

BY BRET HARTE, 1871.

Blackened and bleeding, helpless, panting, prone,
On the charred fragments of her throne
Lies she who stood but yesterday alone.

Queen of the West! by some enchanter taught
To lift the glory of Aladdin's court,
Then loose the spell that all that wonder wrought.

Like her own prairies by some chance seed sown,
Like her own prairies in one brief day grown,
Like her own prairies in one fierce blast mown,

She lifts her voice and in her pleading call
We hear the cry of Macedon to Paul,
The cry for help that makes her kin to all.

But haply with wan fingers may she feel
The silvered cup hid in the proffered meal,
The gifts her kinship and our loves reveal.

—*From second volume of National Car Builder.*

The Improved Hancock Locomotive Inspirator.

One of the most important features of a good injector especially for locomotive service is one which will adapt itself to the range of steam from 25 pounds while at rest or at a pressure of 250 pounds while on the road without any adjustment or spilling at the overflow, and at the same time give a maximum for the fastest trains or a minimum for the lightest. This is accomplished by the improved Hancock inspirator with cold water in tank or with water at a temperature of 120 degrees where blow-backs are used or when the tank water is made hot in any other way. The accompanying cuts show an exterior view and a longitudinal section of the latest improved form of this boiler feeder.

A representative of the NATIONAL CAR AND LOCOMOTIVE BUILDER recently witnessed a series of tests of this inspirator at the company's works in Boston, and the following table shows the performance of the instrument when made to work at its maximum and minimum capacity at pressures of steam ranging from 25 pounds to 180 pounds per square inch. A description of the testing apparatus would take considerable space. Suffice to say that it was quite complete and ingeniously arranged and fairly represented the normal working conditions met in locomotive practice.

TABLE SHOWING THE PERFORMANCE OF A NO. 6 IMPROVED HANCOCK LOCOMOTIVE INSPIRATOR.

Pressure of steam.	Pressure in delivery pipe.	Temp'rature of feed.	Temp'rature of delivery.	Maximum delivery per hour.	Minimum delivery per hour.	Rate.
25	25	75	118	995	.....	.....
25	25	75	113	.....	915	8.1
40	40	75	129	1,025	.....	.....
40	40	75	130	.....	810	21.0
60	60	75	145	1,080	.....	.....
60	60	75	174	....	675	37.5
80	80	75	154	1,150	.....	.....
80	80	75	203	....	600	47 9
125	125	75	184	1,270	.....	.....
125	125	75	263	.....	555	56.3
140	140	75	192	1,305	.....	.....
140	140	75	252	.....	600	54.1
160	160	75	198	1,360	.....	.....
160	160	75	278	.....	660	51 5
170	170	75	202	1,380	.....	.....
170	170	75	282	.....	665	51.9
180	180	75	203	1,410	.....	.....
180	180	75	285	.....	682	51.7

The diagram shown gives a graphical illustration of the performance of the inspirator during these maximum and minimum tests, and shows its range of action. It will be noticed that the action of the inspirator increases in power with the increase of boiler pressure. This is a very valuable quality in consideration of the rapid growth in popularity of higher boiler pressures. On the occasion of these tests 180 pounds boiler pressure was all that was obtainable, otherwise tests would have been conducted with still higher pressures. Each test was continued for three minutes. The action of the injector was rarely broken, and it usually started very easily and with but very little waste of water. Maximum and minimum tests were successfully made with the tank water at 120 degrees Fahrenheit and hotter, one test being made at 135 degrees. At this high temperature of the tank water the testing apparatus developed a slight imperfection that forbade tests with higher temperatures, but there was nothing to indicate that in actual practice the inspirator would not handle successfully water of this and even hotter temperature.

The sectional cut and the foot notes beneath it explain and show very clearly the operation of the inspirator.

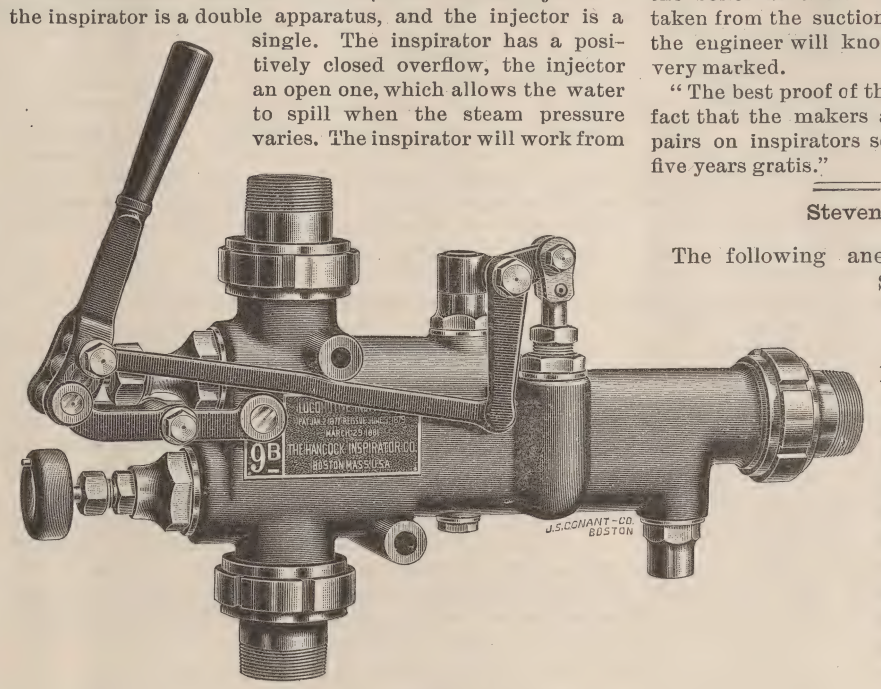
It is claimed by the manufacturers that these inspirators need less labor expended on cleaning them than is necessary with other forms of boiler feeders, as they can be heated very hot without injury, thus breaking up any scale which may form in the tubes. The inspirators are made in four classes, to fit the connections of all standard injectors in common use.

The manufacturers have sent us the following historical sketch and explanation from their point of view of the superior qualities of Hancock inspirators:

"The foundation principle of this inspirator was discovered by John T. Hancock, of Boston, in 1873 or 1874, and consisted in the combination of lifting and forcing jets and tubes in the same apparatus.

"The improved locomotive inspirator of 1894 is an adaptation of the discovery of Hancock to locomotive service. This service is becoming more exacting each year, and it was to meet the extreme service now demanded that the improved inspirator was constructed. In the old locomotive inspirator formerly made by the Hancock Inspirator Company, to control, by the action of one lever the double set of tubes, involved a somewhat complicated mechanism. This has been wholly eliminated in the new inspirator, which is as simple in its operation as a single-tube injector.

"The difference between the inspirator and an injector is the inspirator is a double apparatus, and the injector is a single. The inspirator has a positively closed overflow, the injector an open one, which allows the water to spill when the steam pressure varies. The inspirator will work from



An Improved Hancock Inspirator.

30 to 300 lbs. pressure without adjustment of any kind. The inspirator will take water up to a temperature of 120 degrees Fahrenheit at 200 lbs. steam pressure and deliver it to the boiler, and will go to work instantly even when the suction pipe and the inspirator are hot. The injector will not as a rule take water, at high pressures of steam, at a higher temperature than 80 or 90 degrees, and in the event of the suction and the injector becoming hot, it is necessary to cool them both with cold water before it will go to work. The inspirator will take all the water out of the tank, and will keep at work so long as water is kept at one end and steam at the other.

"The inspirator can be used as a blow-back for heating the water in tank by simply pulling the lever over to the stop, then by pushing it back half the distance it will immediately take the water, and on pulling it back to stop it will feed the boiler at once. It will not break unless the water is taken from the suction, but if it does break from any cause the engineer will know by the sound, the difference being very marked.

"The best proof of the durability of the inspirator is in the fact that the makers are prepared to make all needed repairs on inspirators sold to railroad companies for three to five years gratis."

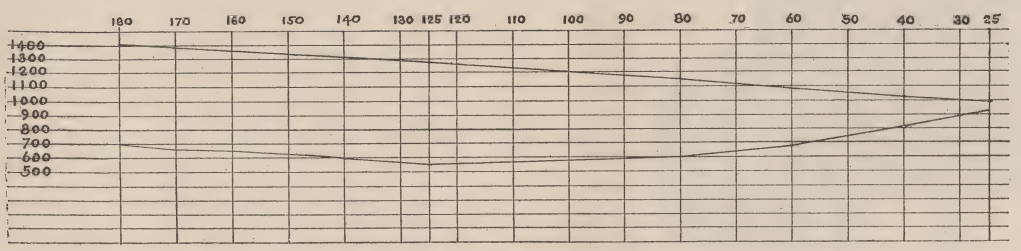


Diagram of Maximum and Minimum Performance.

Stevenson's Queer Smoke.

The following anecdote about the late Robert Louis Stevenson is related in *Harper's Weekly*:

During his last visit to this country Robert Louis Stevenson escaped a very unpleasant experience and never knew it. A journalist, who knew Stevenson by his published portraits, entered a car at Long Branch, and saw the famous author seated in a corner, with a black square box on the opposite seat and a rubber tube dangling from it. The conductor knew the journalist and said to him, pointing to Mr. Stevenson:

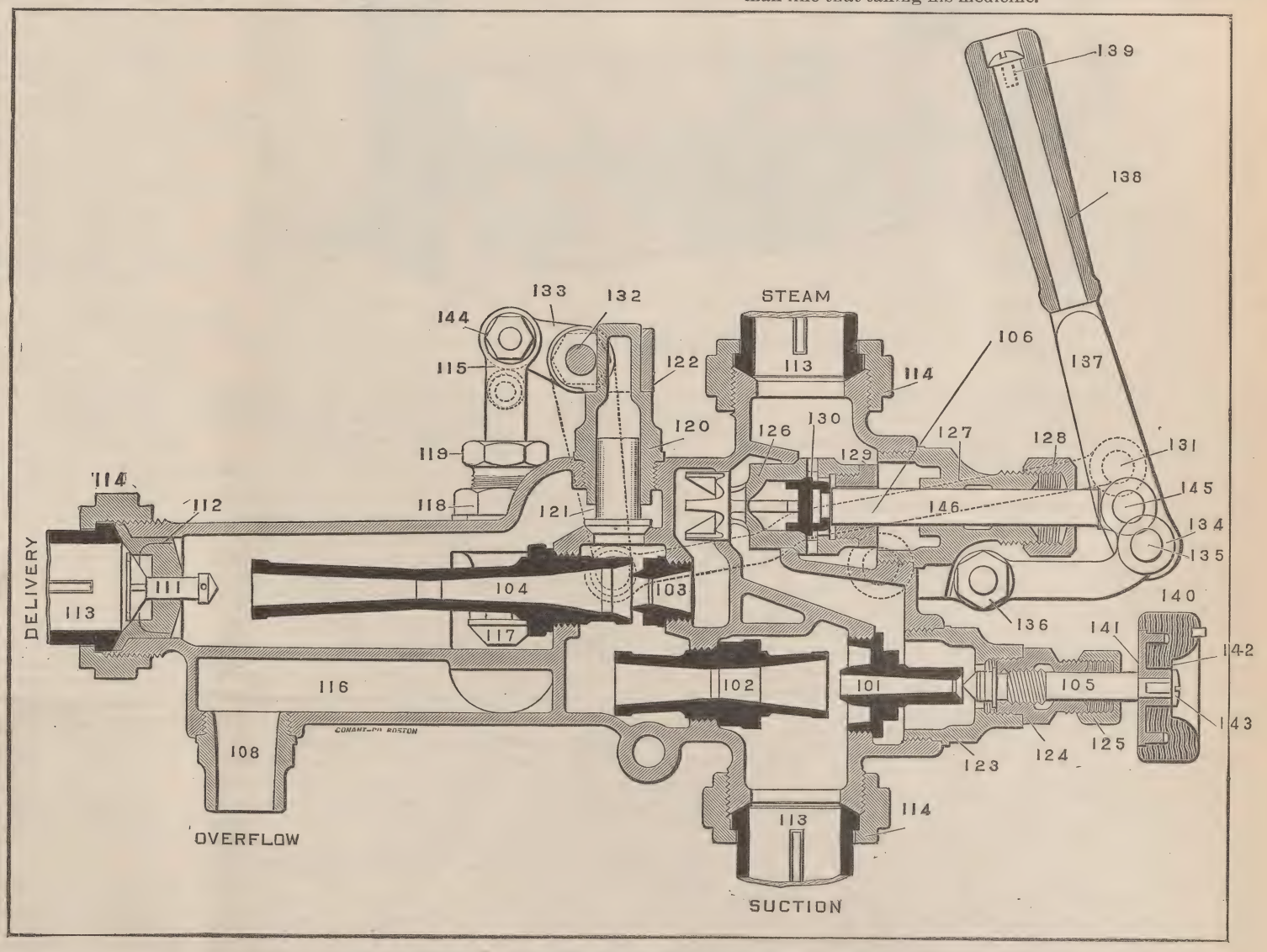
"I'm going to put that man with the long hair off the train. He is smoking. I asked him not to, but he's been at it again when I've been out of the car." "He's not smoking," said the journalist; "that is some device for carrying medicine in the form of a vapor, which he inhales in his lungs. He is an invalid. That is Robert Louis Stevenson, the novelist."

The conductor seemed interested, but only for a minute. "I don't care," he said. "It doesn't matter who he is. I call it smoking, and he's been at it after I told him not to." The journalist tried another tack. "Did you ever read 'Kidnapped?'" he asked.

"Naw," said the conductor. "I don't care what he is; he has got to obey the rules." The journalist persisted. "Did you ever read 'Treasure Island?'"

"Naw," said the conductor. "I don't read many novels, they are all trash, anyhow." "Hold on," said the journalist; "did you ever read 'Dr. Jekyll and Mr. Hyde'? He wrote that also."

"What!" said the conductor. "Did I read 'Jekkle 'n' Hyde'? Well, I guess I did. Couldn't sleep the night I finished it. I seen it played at the theatre, too. It's great; ain't it? Well, that man is a dandy, ain't he? He can smoke—he can, 'tain't what you call smoking, is it? Sick, is he? He does look sick. I'd like to see any one object to a man like that taking his medicine."



Sectional View of Improved Hancock Locomotive Inspirator.

LIFTING.

By a slight movement of lever 137 steam is admitted by valve 130 through the main steam valve 126 to the lifter steam nozzle 101, the velocity of which into 102 creates a vacuum in suction pipe causing water to flow through 102, condensing the steam, and out valve 121 to the final overflow valve 117.

FORCING.

By a slow full movement of lever 137 the main steam valve 126, with disc on end, is opened, when steam is admitted to steam nozzle 103, taking the water away from valve 121, and through the combining tube 104, which increases the pressure in the delivery chamber (as the final overflow valve 117 is closing), opening the line check valve 111 to boiler. Maximum and minimum feed to boiler is controlled by valve 105. No leak at overflow or manipulation of water or steam at change of pressure from 35 to 250 pounds.

Eight-Spindle Multiple Drill.

We illustrate herewith an extra heavy and powerful eight-spindle multiple drill, made by the Bickford Drill and Tool Company, of Cincinnati, O. The machine is specially constructed to meet the wants of large factories, such as marine, locomotive, boiler, car and safe shops, for any work requiring a number of holes at fixed distances from each other. In testing the machine, eight 2-inch holes were drilled through 10 inches of steel plate, which was performed without any chatter or strain on the machine. The heads are movable by rack and pinion upon the rail, and have a very close distance from center to center of spindles, this distance being only 6 inches. The two tables, which are strongly supported by a heavy I-shaped beam, are movable both in the lateral and longitudinal direction, and can be set by graduated disks to one-hundredths or sixty-fourths of an inch, thus allowing holes to be drilled from any desired distance from center to center. The spindles have vertical adjustment, quick approach and return movements, and automatically stop either simultaneously or independently of each other. The driving gears on the horizontal and vertical back shafts, likewise the spindles, are made of steel. The spindle gears, apart from the minimum distance of spindles gear, is very near 1 to 3.

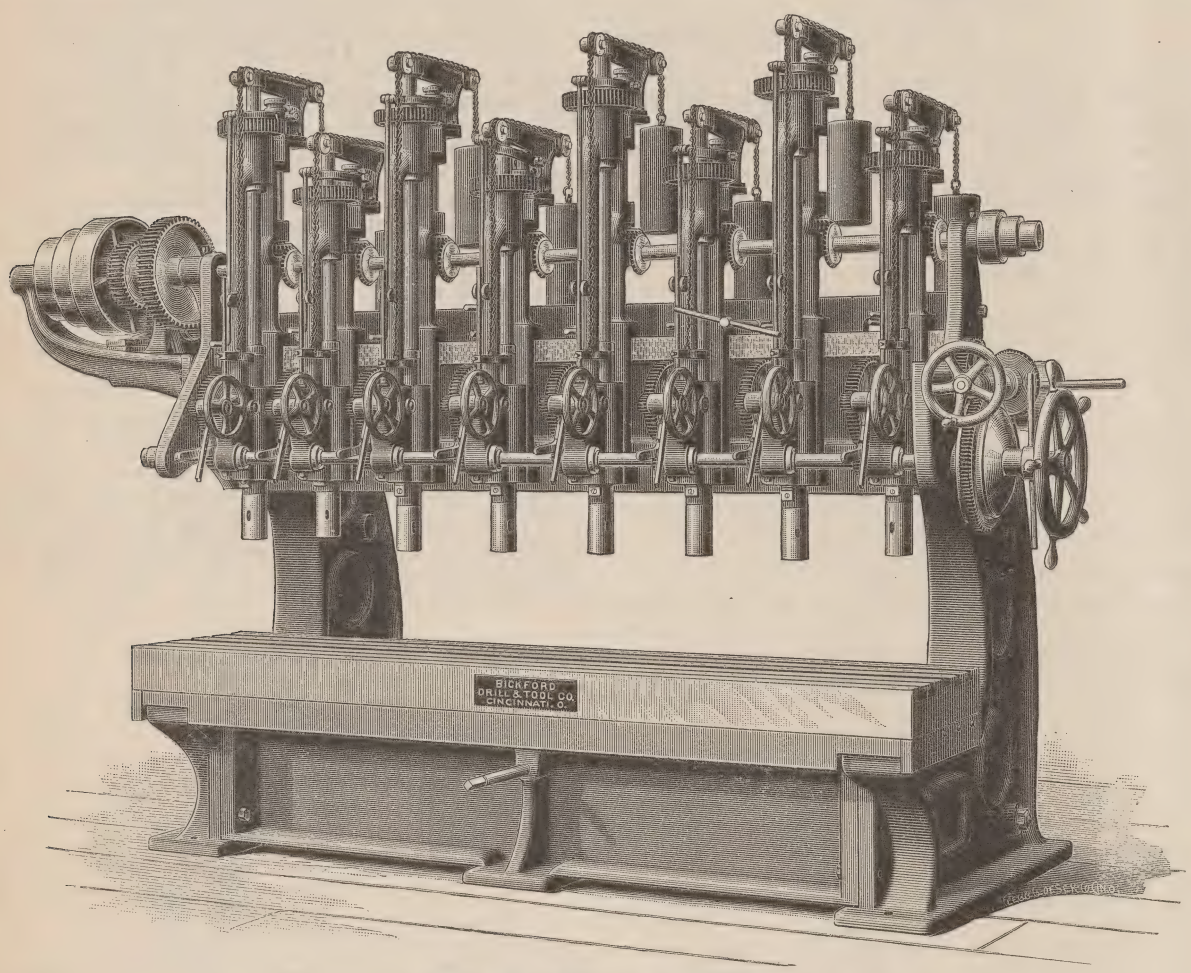
As mentioned above, the minimum distance of spindles is only six inches, but the spindle-gear has about 10 inches diameter, which is effected by making the heads of different lengths. The cut illustrates only one design of these multiple drills, and as these machines are constructed for special classes of work no fixed standard can be adopted for them. The manufacturers have, however, made these machines from 2 to 12 spindles for both heavy and light drilling, and will give needed information respecting special multiple drills, if desired.

A Large Cup and Saucer.

The Builders' Iron Foundry of Providence, R. I., has recently turned out rather a curious piece of work which is really a large kettle and pan, but which was dubbed by the shopmen "The Cup and Saucer." The "cup" is 8 feet 6 inches across and 6 feet 6 inches deep and is 1 inch thick, and the "saucer" is 15 feet across and 3 inches thick, the total weight of both being 23,500 lbs. The firm comments upon this piece of work as follows: "These castings represent what may be called a medium class of our foundry work, for our foundry cranes enable us to handle pieces weighing 50 tons, and we also make many smaller castings, even finding it desirable to have some bench molders. Careful attention is given to the grade of iron required for different classes of work and we are prepared to guarantee a uniform and high tensile strength when desired. Our machine-shop facilities are adequate for finishing a large part of the variety of castings which our foundry can produce."

Improvement in Battery Zincs.

The Brady Metal Company, 115 Boreel Building, New York has been manufacturing for several years past an improved crow foot zinc for battery purposes. It is a well settled conclusion among electricians that, if you reduce the internal resistance of the battery, by bringing the zinc and copper near together, it almost doubles the consumption of both zinc and vitriol. For this reason a short hanger pattern of the crow foot battery zinc has been perfected, which practical experience has demonstrated to be a decided improvement. The component parts of this zinc is an alloy of zinc and mercury, and a number of practical tests recently concluded show that for durability, efficiency and economy, they rank among the best produced.



Bickford Eight-Spindle Multiple Drill.

The Standard Varnish Works.

The plant of this company at Elm Park, Staten Island, N. Y., is one of the largest and most comprehensive in the world. It covers seven acres of ground enclosed on three sides with massive brick walls. Within the enclosure are 26 different buildings, all lighted from the roof, and constructed as near fire proof as modern ingenuity can devise. They are also supplied with a complete equipment of steam fire pumps and fire extinguishers. Incandescent lamps are everywhere through the factory. The capacity of the plant s from 12,000 to 15,000 gallons of varnish a day. There are 40 furnaces for melting gums, 4 furnaces for preparing oils, and 3 boilers of 250, 150 and 100 H. P., respectively, to run the plant. Eight large warehouses are used for tankine and ageing the product. Many miles of pipes run from building to building, overhead and underground, for pumping turpentine, oils, and the finished product, none of which is handled, from tank to tank and from building to building. All the raw materials are tested in the laboratory, and a practical finisher also gives the varnishes the same tests they get in actual use. The carriage varnish department is very extensive, and a very large and seasoned stock is constantly carried. The plant has a water frontage of several acres, with pier and slip for steamers and vessels, and the Baltimore & Ohio railroad tracks run through the premises. A short distance from the factory the company owns 11 acres of ground on which it has built a number of houses for the workmen, and it has become quite a community.

The company's offices are at 29 Broadway, New York. It has a Western branch at 2629 Dearborn Street, Chicago, and a foreign branch at 23 Billiter Street, London.

The Central Railroad and Banking Company, of Georgia, after a test of the Sterlingworth Steel Bolster, have ordered this device for 100 cars, and propose making it standard.

The Sterlingworth Railway Supply Co. have entered into a term-of-years contract with the Cambria Iron Co. for the exclusive manufacture of their metal brake beams.

Mr. Robert Laidlaw, President of the Laidlaw-Dunn-Gordon Pump Company, of Cincinnati, was elected Treasurer of the National Association of Manufacturers, which convened at Cincinnati Jan. 22. Mr. Laidlaw was one of the leading spirits in organizing this association, and much of the success of the convention was due to his skill and untiring energy. The delegation was banqueted at the new plant of the Laidlaw-Dunn-Gordon Pump Company.

The many friends of the Graham Equipment Company will be pleased to learn that the genial and popular Vice-President, Granville S. A. Gardiner, has retired entirely from his ticket business in Providence and will devote his attention in future to the sale of the Graham truck. The business of this company has grown to such proportions it was deemed a wise move on the part of the management to secure Mr. Gardiner's entire services. He will spend his time when not on the road between the New York and Boston offices of the company.

The Smith Railroad Lubricator Company, Havemeyer Building, New York City, has been formed to introduce in the New England States, and also for export, Smith's axle grease and cooling compound, as well as headlight and signal oils. The compound has been extensively used by the Pennsylvania, Chesapeake & Ohio, Chicago & Eastern Illinois, and several other railroads. Mr. F. J. Jenner is President and Mr. Elmer Fletcher is Treasurer of the company, which has obtained the exclusive right to manufacture the lubricant according to the formula of the late Arthur W. Smith, and has established works at Elizabethport, N. J.

Messrs. William Harland & Son, manufacturers of the celebrated Harland's English varnishes, have appointed a special traveling salesman to visit the railroad trade in the United States. These varnishes have been very well received here and have given excellent satisfaction wherever used. Mr. F. C. Reynold's is the agent for this firm in the United States. His offices are at No. 4 Gold street, New York. The factory and chief offices are in Merton, Surrey, England.

"Ef I had the money," remarked Mr. Weary Watkins, "ju know what I'd do? I'd hire me a private car with real feather beds on the trucks, an' travel about in a dream of happiness the year 'round."

The Haton coal mine, which the French are working in Tonquin, is said to yield about 500 tons a day of excellent coal by the simple method of stripping. The length of the seam is stated at 16 miles, and the thickness at nearly 200 feet. It has been pointed out that according to the ratio of reduction in bulk in the formation of soft coal from vegetable matter, as usually estimated, this thickness of coal would represent about 1,350 feet of fairly compact woody substance; and might furnish some astonishing figures as to the time and the extent of the original vegetable growth required to produce such a mass.

Our Directory.

OF OFFICIAL CHANGES IN FEBRUARY.

We note the following changes of officers since our last issue. Information relative to such changes is solicited.

Atlantic & Danville.—Chas. O. Haines is appointed Superintendent and Chief Engineer. The general offices are moved from Portsmouth to West Norfolk, Va.

Atlanta & Florida.—Wm. Spencer is appointed Master Mechanic, with office at Atlanta, Ga., vice A. W. Collier, resigned.

Baltimore & Ohio.—Master Mechanic G. C. Smith is transferred from Grafton to Keyser, W. Va., and is succeeded by S. A. Souther.

Chicago, Milwaukee & St. Paul.—N. S. Kimball, Master Mechanic at Green Bay, Wis., has resigned. H. M. Bell, Superintendent Lake Superior division, has resigned, and is succeeded by R. R. Minturn. The jurisdiction of Supt. J. R. Williams is extended to cover the Hastings and Dakota divisions. J. R. Foster is appointed Superintendent of the Wisconsin Valley division.

Chicago, Rock Island & Pacific.—Division Superintendent H. A. White, of Trenton, Mo., died Feb. 8. Henry Fox is appointed Superintendent of the Kansas & Nebraska Division, with office at Harrington, Kan. Superintendent W. J. Lawrence is transferred from the Eastern Division to Trenton.

Choctaw, Oklahoma & Gulf.—H. E. Yarnall is appointed Purchasing Agent, with office at South McAlister, I. T.

Columbus, Sandusky & Hocking.—Wm. Thornburg is appointed General Superintendent, with office at Columbus, O., succeeding H. O. Pond, resigned.

Florida Southern.—General Manager R. B. Cable has resigned, and the duties of the office are assumed by Superintendent W. B. Denham, Palatka, Fla.

Interoceanic of Mexico.—General Manager Edward S. Jackson will resign May 1.

Jacksonville, Mayport & Pablo.—C. S. Adams succeeds John L. Marvin as Receiver.

Kentucky Union.—General Superintendent James Phillips died Feb. 4.

Laurens.—A. C. Haskell is appointed Receiver, office at Columbia, S. C.

Macon & Northern.—Wm. H. Ross has succeeded N. E. Harris as Receiver.

Monongahela Connecting.—General Manager Walter C. Quincy died Feb. 3.

Monterey & Mexican Gulf.—Thomas Riley is appointed Superintendent with office at Monterey, Mex.

New York Central.—Division Master Car Builder Loren Packard died Feb. 15.

Norfolk & Western.—President F. J. Kimball and Henry Fink are appointed Receivers.

Northern Pacific.—E. J. Pearson is appointed Superintendent of the Missouri River & Yellowstone Division, vice John Dorsey, deceased.

Ohio River.—Geo. A. Burt is appointed General Manager, with office at Parkersburg, W. Va., vice J. C. Gardner resigned.

Pennsylvania Railroad.—Superintendent Jacob S. Morris, of the Toledo Division, died Feb. 18.

Plant System.—Bradford Dunham is appointed General Superintendent.

San Antonio & Gulf Shore.—Henry Terrell is appointed Receiver, with office at San Antonio, Tex.

Savannah, Florida & Western.—General Superintendent Robert G. Fleming died February 20.

Spokane Falls & Northern.—Austin Corbin is appointed Assistant General Manager, with office at Spokane, Wash.

Tennessee Coal and Iron Railroad Company.—G. B. McCormack is elected General Manager, vice T. H. Aldrich, resigned.

Texas Central.—Superintendent Wilbert Erwin was killed Jan. 25.

Toledo, St. Louis & Kansas City.—R. B. F. Pierce is appointed Receiver, succeeding S. R. Callaway, resigned.

Toledo & Maumee.—Burton Foster, General Manager, has resigned, and is succeeded by H. C. Ellis.

Velasco Terminal.—General Manager W. M. D. Lee has resigned, and is succeeded by H. G. Curtis.

Washington & Chesapeake Beach.—Winfield J. Taylor and Lincoln H. Hyer are appointed Receivers.

Washington & Columbia River.—President W. T. Tyler is appointed Receiver.

Wiscasset & Quebec.—General Manager W. F. P. Fogg has resigned.

Employment.

The Editor of the NATIONAL CAR AND LOCOMOTIVE BUILDER knows of a number of locomotive engineers who are out of employment, and who he would be pleased to recommend to those needing their services as experienced, steady and entirely capable and trustworthy engineers.

Wanted.

WANTED—By a large manufacturer, some new specialty to manufacture for the railroad trade. Address "ADVERTISER," care of the NATIONAL CAR AND LOCOMOTIVE BUILDER.

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NATIONAL CAR AND LOCOMOTIVE BUILDER

APRIL, 1895.

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The Standard Oil Company is building 100 tank cars at its shops.

The Gulf & Interstate Railroad of Texas is in the market for locomotives.

The Findlay, Ft. Wayne & Western will soon order several locomotives.

The Savannah, Americus & Montgomery is about to order 300 flat cars.

The Chicago, Paducah & Memphis is reported in the market for 200 cars.

The Mobile & Ohio has ordered 100 box cars from the Mt. Vernon Car Manufacturing Co.

The Duluth, Missabe & Northern is contemplating ordering about 200 ore cars this spring.

The Masterman Car Equipment Company has been organized in Oakland, Cal., with $500,000 capital.

The Toledo, Ann Arbor & North Michigan has ordered four locomotives of the Baldwin Locomotive Works.

The Memphis Car & Foundry Co., of Memphis, Tenn., is building 600 box cars for the Memphis Fast Freight Line.

The Missouri Car & Foundry Company has an order to build 100 refrigerator cars for Armour & Co., of Kansas City.

The last general assembly of Alabama passed an act which makes train robbery in that State punishable by death.

The Atlantic & North Carolina road has given an order for a number of locomotives to the Richmond Locomotive Works.

The Cleveland, Cincinnati, Chicago & St. Louis has ordered six locomotives of the Schenectady Locomotive Works.

The Pittsburgh & Lake Erie road has given an order for 500 coal cars to the Michigan Peninsular Car Company, of Detroit.

The Wells & French Company, of Chicago, has an order for 300 additional freight cars for Armour & Co., of Chicago.

The Memphis Car & Foundry Company, of Memphis, Tenn., has just delivered 16 tank cars to Farrell & Co., of Omaha, Neb.

The Duluth, Mississippi River & Northern Railroad expects to place an order for one combination car and one passenger coach.

The Delaware, Lackawanna & Western contract for 500 freight cars has gone to the Jackson & Woodin Manufacturing Company.

The Railroad Supply Company, of Chicago, has recently been organized by Messrs. W. E. Denison, W. W. Wegg and B. M. Spencer.

The St. Louis, Vandalia and Terre Haute has ordered 110 box cars of the Indiana Car and Foundry Company, of Indianapolis, Ind.

Cincinnati is the railway center of Ohio, 18 railways entering it, the through trains of which pass through 70 counties of the State.

The Wheeling & Lake Erie has placed orders for 600 cars and three locomotives, which indicates an increase of business on that road.

The Pittsburgh & Lake Erie has recently placed an order for six 10-wheeled freight engines with the Pittsburgh Locomotive and Car Works.

The Gulf & Interstate Railroad, of Texas, now building, is in the market for a number of cars. C. J. Jones, of Galveston, is General Manager.

The South Baltimore Car Works, of the B. & O. R. R., are building nine of the Campbell & House combination cars, illustrated and described in our last issue.

The Erie Car Works, of Erie, Pa., have been purchased by Messrs. William Hamilton and John C. Knoll, who, it is understood, will rebuild them.

All the crossing gates on the Morris & Essex Railroad have been painted red in the center to attract the attention of persons approaching the tracks.

The Chicago & Northwestern depot at St. Charles, Minn., and a large elevator containing 12,000 bushels of grain, were totally destroyed by fire March 22.

The shops of the Johnson Railroad Signal Company, at Rahway, N. J., are to be sold by the Receiver, who has been receiving proposals up to March 29.

The awarding of the contracts for the 2,000 cars to be ordered by the Missouri, Kansas & Texas, that has been hanging fire for several months, has been postponed.

The Baltimore, Chesapeake & Atlantic will soon let an order for new cars for a complete train to be used in the summer traffic between Baltimore and Ocean City, Md.

The Baldwin Locomotive Works will build the new engines for the Baltimore, Chesapeake & Atlantic, mentioned in our last issue. The number is not decided on yet.

The Cleveland, Cincinnati, Chicago & St. Louis will soon order 500 new freight cars. It is said that about 20 new passenger cars will also be contracted for shortly.

The Union Tank Line is preparing plans for tank cars to be over 40 feet long. When the order is given out it will probably be for 90 cars. The cars will weigh 108,000 pounds.

The Lehigh Valley has received the first lot of 25 engines from the Baldwin Locomotive Works, ordered last January. This company is also reported in the market for six passenger engines.

The contract for the iron and steel work of the fixed spans and draw of the Pennsylvania Railroad bridge across the Delaware River has been awarded to A. & P. Roberts of the Pencoyd Iron Works.

President Clark, of the New York, New Haven & Hartford Railroad, announces the fact that business is improving throughout New England. Factories and tradesmen are doing increased business.

The Concord & Montreal has ordered three locomotives from the Baldwin Locomotive Works and two from the Schenectady Locomotive Works. The order includes passenger and freight locomotives.

The Nawab Nawez Jung Bahadur, now in this country, wonders why American workingmen receiving $3 a day are discontented, while the workingmen in his country are able to get gay on $1.50 a month.

It is reported that the Southern Pacific is about to order 10 locomotives for use on the Atlantic system. The Schenectady Locomotive Works is now building 20 engines for this company, 17 of which are for passenger service.

The Canadian Pacific Railway directors have decided, as a measure of retrenchment, to make a general reduction in wages and salaries. A five per cent. cut will be made in salaries up to $2,000 per year, and above that ten per cent.

The Central Railroad & Banking Company, of Georgia, is going to build 200 new freight cars at its Savannah shops. A contract was signed on March 5 to equip all of these cars with the Crane Air-Brake Company's automatic air-brake system.

The gross earnings of the Santa Fe for February were $2,814,293, a decrease of $50,488 as compared with the same month last year. For the last week in February the earnings show an increase of $19,983 over those of the corresponding week of last year.

The passenger earnings of the Louisville, New Albany & Chicago (Monon Route) for the first two weeks in March this year broke all previous records for the corresponding period. They were $26,200, as compared with $18,430 for the same period last year, an increase of $7,770.

The Brooklyn Elevated Railroad Company has given its women night ticket-sellers notice that their places will be taken by men at an early date. The women will have day work, the company believing it unsafe to expose them to possible contact with malicious and boisterous people at night.

The order for 3,000 box cars, announced in our last issue as certain to be given by the New York Central, was placed early in March. The new equipment is to be standard box cars of 60,000 pounds capacity. The Buffalo Car Manufacturing Company will build 1,500 of the cars, and the Michigan-Peninsula Car Company will build the same number.

The engineers of the Union Pacific have been paying one of their number a salary of $2,500 a year to look after their grievances, but the lopping off of so many branches from the system has reduced the number of employees to such an extent that the engineers have decided to dispense with his services.

Mr. Julius Pintsch, of Berlin, reports that up to Jan. 1, 1895, there were 64,000 cars equipped with the Pintsch lighting system in Europe, North and South America, India and Australia. Nine thousand cars were equipped with this system during the year 1894, which shows a very important progress.

A deal has been about closed by which the Kansas City, Fort Scott and Memphis Company will purchase the Little Rock and Memphis road and extend it into northern Texas. This will conclude a very important piece of railroad work in bringing Alabama coal lands in direct communication with Texas territory.

A gang of 50 tramps took forcible possession of a freight train on the Philadelphia, Wilmington & Baltimore, March 8, and held possession of it for two hours. Fifty policemen met the train at Wilmington and captured about a dozen of the tramps, the balance abandoning the train in time to succeed in escaping.

The Pennsylvania Midland has ordered of Messrs. Murray, Dougal & Co., of Milton, Pa., 700 cars, including 500 hopper coal cars, 100 box cars and 100 platform cars. The delivery of these cars is to extend over a considerable period, the company at present having only 10 miles of road built. It has also ordered 10 locomotives.

Augusta, Ga., was visited by a furious tornado March 20, which rendered 75 people homeless, but fortunately killed no one, although it destroyed about $30,000 worth of property. One half of the roundhouse of the Central Railroad of Georgia was demolished and one locomotive was badly damaged, as was also the paint shop of the same road.

A compromise has been agreed on between the officers and employees of the Chesapeake, Ohio and South Western in the matter of the cut in wages on that road about a year ago. Hereafter if in any month the gross earnings equal or exceed the gross earnings of the corresponding month of 1892, the wage scale of 1892 is to be paid; if not, the reduction will stand as now.

The *Democrat*, of Corning, N. Y., notes the fact that the Fall Brook Railway has gone through another year with a very small accident list, and has sustained its record of never having killed a passenger. During 1894 the number carried was 448,000; none were killed and only two were injured, both of whom were intoxicated. This road does a large freight business, both northward and southward.

The Wabash roundhouse at Toledo, O., was burned on the morning of March 17. In fighting the fire before the arrival of the city fire department two Wabash employees and a spectator were killed, and nine employees were injured by the wall of the house falling on them. The roundhouse had 20 stalls and contained six locomotives when the fire broke out. The house was completely destroyed, and the engines were badly burned.

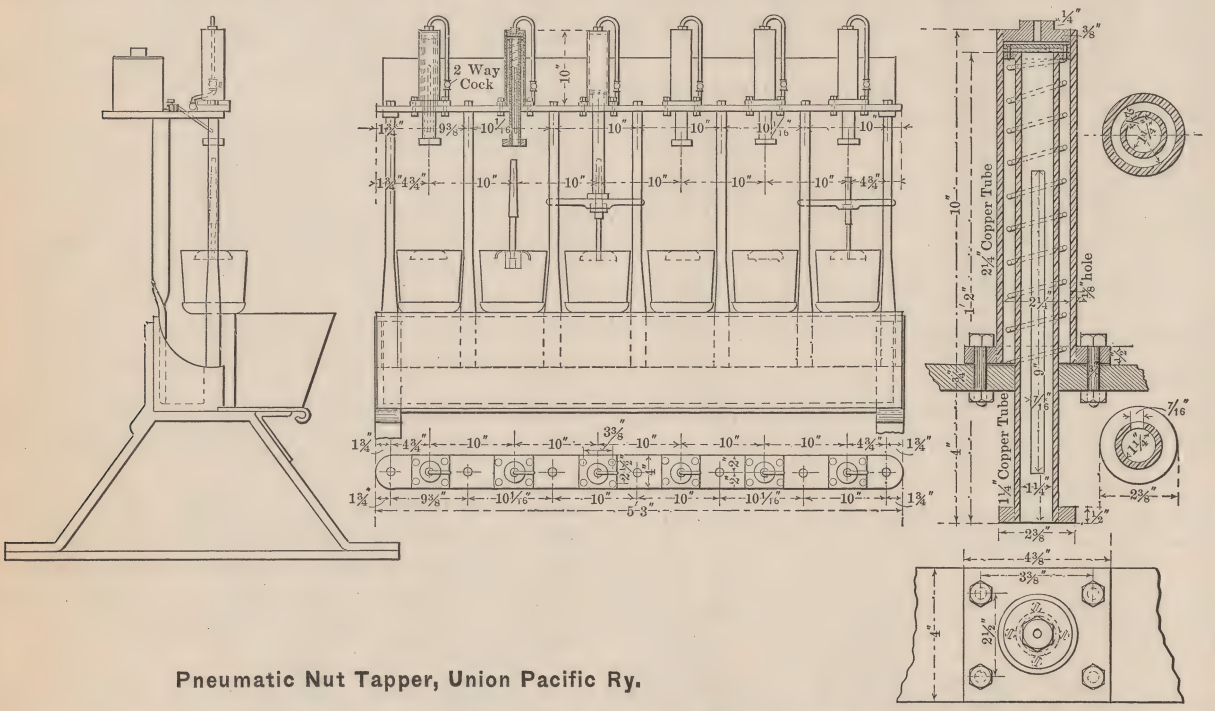
The Brooklyn Bridge cars have been equipped with incandescent lamps, the current for which will be supplied from a stationary plant, the connection with the cars being effected by means of an overhead wire and trolley. There are ten 16-candle power lamps in each car. The cost of equipping was about $16,000, and the annual saving, as compared with gas, is expected to be about $4,500, so that the equipment will pay for itself in a very few years.

The widest canal in the world is said to be the Chenab Irrigation Canal, in the Northwest Province, India. This canal is 110 ft. broad, and will be increased to 200 ft. broad when finished. The head works are at Kanki, where a shutter dam extends across the river, and is about 1½ miles long. When finished the main channel of the canal will be 450 miles long, while the principal branch channels will have an aggregate length of 2,000 miles, and the village branches will be about 4,000 miles long.

Pneumatic Appliances for Railroad Shops.

We are enabled to present on this page, through the kindness of Mr. J. H. McConnell, Superintendent of Motive Power and Machinery of the Union Pacific, detailed drawings of two very useful pneumatic appliances that are in use at the Omaha shops of this road, and have proved themselves practical and efficient labor savers, and that have not before been illustrated.

Our first illustration shows an automatic compressed air arrangement applied to a 6-spindle nut tapper. It will be seen that the arrangement is very ingenious but simple in construction and therefore not veryexpensive. It has proved itself to be a valuable laber saver and has given good general satisfaction. Its construction is shown so plainly in the drawing that an extended description is unnecessary, but it may be said that, as shown, there is above each tap a small vertical cylinder fitted with a piston. The nuts are dropped over the end of the tap and the socket bar is put in place. Through the cock compressed air is then admitted to the upper end of the cylinder, forcing the piston rod against the bar and feeding the nut until well started. The air is then turned off, when the spring returns the piston to its normal position.



Pneumatic Nut Tapper, Union Pacific Ry.

Our next illustration shows drawings of a sandpapering machine used for finishing off the exterior of passenger cars preparatory to painting. It uses less sandpaper and does better work than hand work. We previously mentioned a case where two passenger cars were placed together and examined. Before being painted and varnished the exterior of one car was finished off by hand sandpapering and the other by this machine. The finish and luster of the machine-sandpapered car were pronounced by all who saw it as far superior. One of those present remarked that the sides of this car were veritable mirrors, in which the color of the eyes could be plainly seen. The following is a description of the drawings:

Fig. 1 is a longitudinal section on the line *YY*. Fig. 2 is a half cross section and half front elevation with the sand-papering disc removed. Fig. 3 is a half section on the line *ZZ*, Fig. 2, and a half side elevation. Fig. 4 shows the bore of the cylinder. The engine or motor *C* here shown is a modification of the Moffett drilling engine and is operated by compressed air; but any light self-contained motor, rotary in action, capable of high speed and of developing considerable power, and which can be fixed directly to the shaft *D*, carrying the sandpapering disc *E*, would answer, and the motive power may be either compressed air, steam or electricity.

By suitable hose connections air is admitted at *T* and by the passages *F* enters the cylinder at ports *G*, acts upon the blades *H*, and revolves the center *I*. The exhaust takes place from ports *J* and passages *K* to the atmosphere. The shaft *D* and disc *E* by reason of the key *L*, are forced to revolve with the center *I*, but as the keyway in the shaft is longer than the key, the shaft is capable of longitudinal adjustment, Longitudinal adjustment of the shaft and disc is obtained and regulated by the center stem *M*, sleeve *N* and check nut *O*. The manner of securing the sand paper to the disc is clearly shown by the drawings. A guide frame of wood, *P*, is secured to the cylinder; the relation of the face of the disc and sandpaper to the face of the guides regulates the amount of the cut which will be taken. Handles by which the operator holds the machine against the work to be surfaced are shown, marked *S*.

The machine is intended principally for dressing off the sides and ends of passenger cars; the sheathing, after the usual machine planing is applied to the car, is then brought to a finished surface for painting by the sand papering machine. By this means all handwork is done away with.

Fig. 2

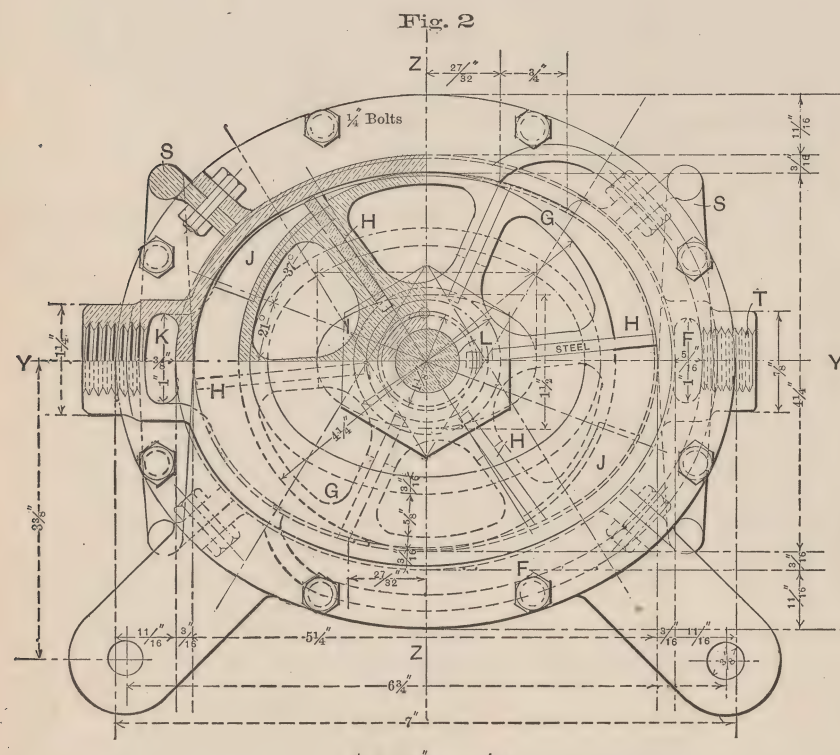
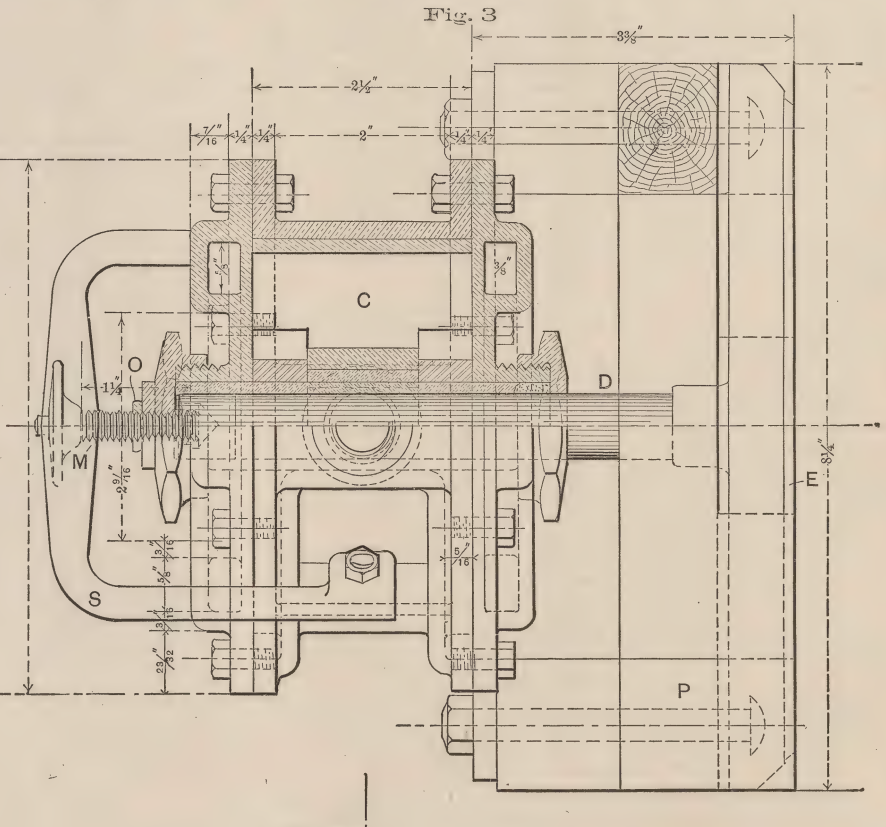


Fig. 3



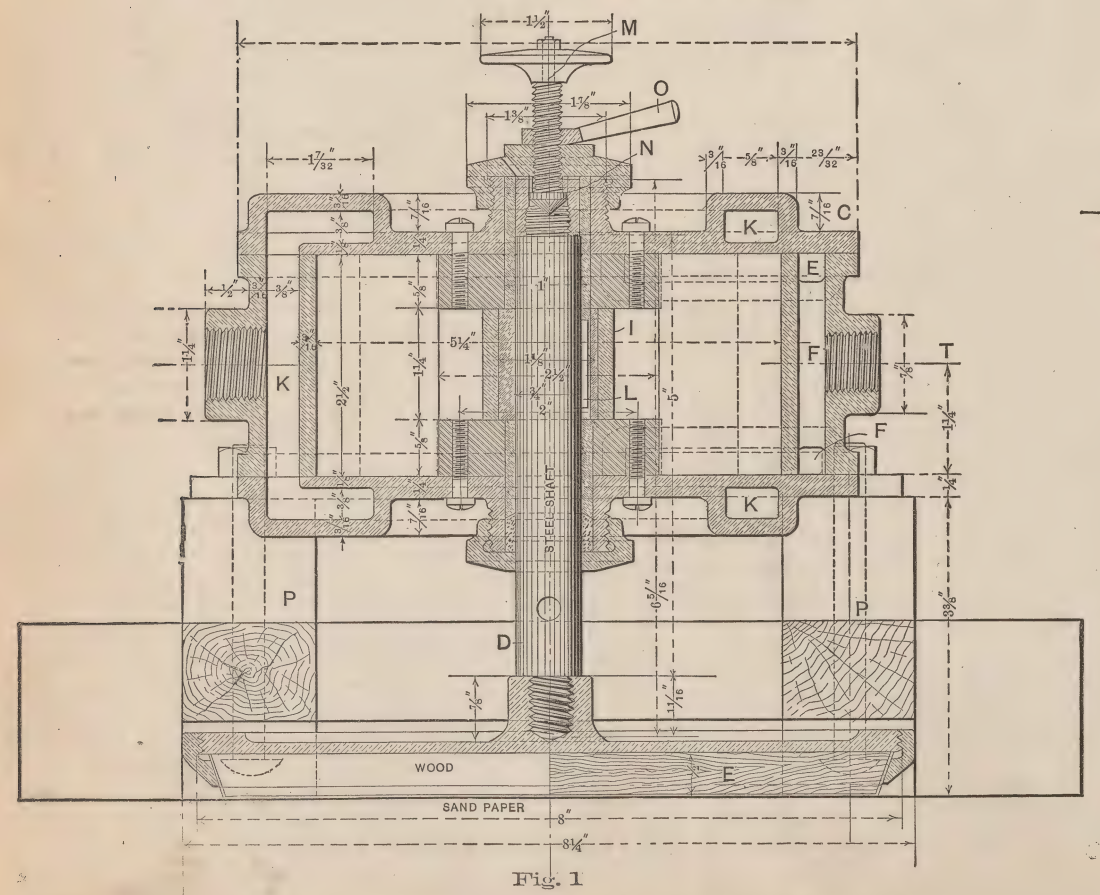
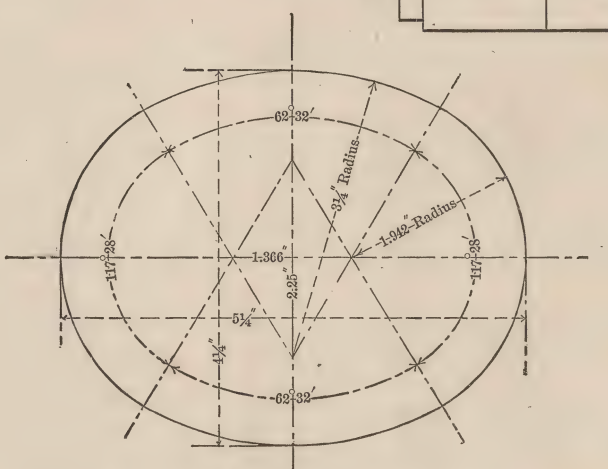


Fig. 1

Pneumatic Sandpapering Machine, Union Pacific Ry.



OVAL OF BORE OF CYLINDER.

Fig. 4

Annual Report of the Pennsylvania Railroad.

The latest annual report of the Pennsylvania Railroad Company, which was recently issued, shows that the discouraging business conditions met with during the year were to a considerable extent offset by skilfull management and the reduction of operating expenses, without permitting the property to fall into inferior condition. The gross earnings on all the lines east and west of Pittsburgh were $122,003,000. The operating expenses were $85,142,-174.53, and the net earnings were $36,860,825.54. The freight carried was 120,548,652 tons, and the passengers numbered 77,106,555. Expenditures for construction and equipment on the main line amounted to $1,497,436.07, and on leased and auxiliary lines, $892,937.09, a total outlay of $2,390,373.16. The expenditure on the main line covers new equipment, real estate, and the extension of Broad Street station, Philadelphia. On branch lines the most costly items were the Delaware bridge, the completion of the Philadelphia and Delaware County Railroad, the construction of 12 miles of the Ebensburg & Black Lick road, and the purchase of additional real estate on the line of the Pittsburgh, Virginia & Charleston Railway, near Pittsburgh. The capital stock at the end of the year was $129,-298,200, an increase of $27,150 over the previous year. Freight rates on the three grand divisions east of Pittsburgh and Erie declined $\frac{29}{100}$ of a mill per ton mile, cost of movement $\frac{32}{100}$ of a mill, and net profit per ton per mile has increased $\frac{3}{100}$ of a mill. Earnings per passenger per mile have decreased $\frac{22}{100}$ of a mill, and the cost of transportation per passenger per mile $\frac{2}{100}$ of a mill, the average profit being $\frac{20}{100}$ of a mill less than in the former year.

Referring to the growing dangers of allowing electric surface road to cross steam railroads at grade, the report says:

"The work of elevating the roadway of the United New Jersey division through the city of Elizabeth has been so far completed as to permit trains to be transferred to the elevated tracks, thus eliminating the dangerous grade crossing of the Central Railroad of New Jersey, and also of all the streets in the built-up portion of that city. Further large outlay will be required in connection with this work in providing a new station and finishing the embankment. The elevation of the tracks on the New York division between Frankford and Holmesburg Junction, Philadelphia, was also continued, and several grade crossings were abolished under the satisfactory and equitable contract made with the city of Philadelphia. Under this contract work is still in progress, and will finally result in eliminating all grade crossings on this portion of your line in that city. Considerable progress has been made toward removing the dangerous crossing of the North Pennsylvania Railroad and your Connecting Railway, and this work, through the liberal appropriations made by your company and the city of Philadelphia, will be completed during the present year.

"Your management believes, however, that it is wise, for the present at least, to suspend further large expenditures of this character until definite legislation is had to prevent the increase of highway crossings at grade. It certainly does not seem to be equitable that outlays of this character should be made by the company when the object had in view is practically defeated by the continued opening of new highways and by the privileges granted to electric lines to use the same at grade. Not only is this the case in cities, but also on other public roads, and the peril resulting therefrom has already been made apparent by the numerous accidents that have occurred at such crossings."

A Great Magnet.

Several years ago Col. W. R. King, U. S. A., Willetts Point, N. Y.. constructed a magnet having for cores two old Rodman 15-inch guns, weighing 50,000 pounds each. It was turned into a club-footed magnet by the addition of several tons of heavy iron plates. The coil consisted of old torpedo cables 14 miles long, carrying 20 to 25 amperes. The armature consisted of 6 platform plates bolted together. These early experiments led to the making of a single bar magnet (the core being a gun), with the aid of which some interesting results are looked for. The gun used is 16 feet long. In a letter to the *Electrical Review*, Colonel King says: "Weight of gun, 50,000 pounds. Length, 16 feet. Coils extending 8 feet. Cross section, 300 to 1,500 square inches. Material, cast iron. Length of wire, about 10 miles or about 5,250 turns, which, with a current of 21 amperes, gives over 110,000 ampere turns. Maximum pull, 44,800 pounds; the magnetic circuit being completed by a pile of wrought iron plates. The armature had a cross section of 131 square inches, At a distance of about 71 feet from the muzzle the field created by the magnet is equal to the earth's field, while at 1 foot from the muzzle it is about 338,000 times as strong as the earth's field."

The force of this great magnet is illustrated by photographs showing 5 cannon balls weighing 320 pounds each hung suspended one beneath the other from the muzzle of the gun, and showing a soldier standing in front of the muzzle whose breast is covered with spikes sticking out at all angles, being held against his breast by the attraction of the magnet, his body acting as a barrier to prevent the spikes flying to the muzzle of the gun.

A northbound passenger train on the Missouri, Kansas & Texas collided with a freight train near Dallas, Tex., March 21, resulting in the death of the passenger engineer and a brakeman of the freight. The passenger conductor and two passengers were injured.

The Lenoir Car Works.

The Lenoir Car Company's new plant, situated at Lenoir City, Tenn., is located between the Southern Railway tracks and the Tennessee River, on a plat of ground 600 feet wide by 3,000 feet long. Its principal shop is a smithing and machine shop 70 by 260 feet. This shop is equipped with modern machinery for the shaping, forging and drilling of iron and the manufacture of bolts, and with wheel, axle, planing and riveting machinery. The power for this shop is located in an annex, where is also located a dynamo for the lighting of the entire plant. Both coke and oil furnaces are used, the latter being supplied with oil from tanks located upon ground sufficiently high to give an adequate pressure for feeding the furnaces without pumping.

The wood-working shop is 100 by 300 feet, also equipped with modern machinery, and having an annex 64 by 66 feet, in which is located the boilers and the engine which runs the wood-working machinery. There is also in this annex an air-compressor and air reservoir, which drives the riveting machinery, and also furnishes the erecting shop with air for testing the air-brake equipment applied in this shop. The erecting shop is 120 by 300 feet, with four tracks for the erection of cars and two supply tracks for material.

Attached to the smithing shop is a long shed under which trucks are riveted up and erected. The general store room for small supplies is 50 feet by 100 feet, and the store room for paints, waste, etc., is somewhat smaller. The several shops are connected by tracks extending into the lumber yard, running through the smithing and machine shop, store room, and to the foundry near by. There is also a small saw mill which the company uses for resawing lumber and to some extent in the manufacture of lumber from the log.

There are standard gauge tracks connecting with the southern railway tracks, foundry tracks, lumber yard and iron yard, and also between the shops; these tracks being built of 60 pound steel rails, and extending upon every side of the several buildings. The company is now engaged in building 500 hopper bottom gondolas of 60,000 pounds capacity for the Southern Railway, the trucks of these being entirely built of iron and steel with the exception of the bolster, which is of oak. These cars are equipped with Janney couplers, Westinghouse air brakes, National hollow brake beams, and are in every respect strong and substantial cars.

The company has for fire protection a system with 4-inch and 6-inch pipes, regular standard fire hydrants, etc., with pressure sufficient to throw water over any buildings on the premises, the reservoir being on an elevation over 200 feet higher than the shops, the water being put into the reservoir by a steam pump operated from the boiler room. This water is taken from a spring near by which flows about 600,000 gallons per day.

Railroads in China.

China has only about 100 miles of railroad at present, but the outlook is encouraging for some active railroad building there in the next few years. The small existing mileage is the growth of 20 years, accomplished in the face of the strongest possible opposition. The fatal mistake has become apparent to the people and the Government during the war with Japan. It has proved a potent contributing cause to China's defeat. It may be expected that the lesson has been learned, and that in extensive railroad construction means will be sought to establish the rapid transportation necessary for actual protection.

The obstacles opposed to the admission of railways in China at the outset were peremptory and insurmountable, and have only yielded slowly and under strong official pressure. In 1876 some English capitalists, moving with utmost secrecy and celerity, laid a road seven miles in length between Shanghai and Woo-Sung, but it was at once bought by the surprised Chinese to avoid international complications and instantly torn up, root and branch, disappearing as suddenly as it came. The next one, also seven miles in length, was built in Northeastern China to connect the coal fields of Kaiping and Tong-Shan with a canal leading to the Peh-Tang River, and this, in spite of some initial hostility, has remained in operation, the first locomotive having been placed upon its track in 1881. Within the ensuing five years the road has been further extended by a length of 20 miles, the material and equipment being brought from England. In 1888 the government itself directed the extension of this road to the important city of Tien-Tsin, a distance of 87 miles, and it has been in active use since its completion, carrying passengers and all kinds of freight, besides the coal which it was originally built to transport, and it now excites no sentiment of popular hostility. Further extensions were planned, but they have been delayed by various causes, the war being chief among them, and will undoubtedly be resumed when that is over. The Tien-Tsin road is to be extended to Shan-Hai-Kwan, at the sea end of the Great Wall of China, with the design of carrying it forward from that point into Manchuria, and perhaps to a connection with the Russian Trans-Siberian system. A southward coast line to Shanghai is also proposed, its commercial and military importance being strongly urged, and other enterprises of like sort are receiving official attention.

Business on the Big Four and Chesapeake & Ohio is said, by President Ingalls, to be on the pick-up.

Attendants at the Grand Central Station, New York.

The New York Central Railroad established on March 1 the practice of having about a dozen conspicuously uniformed "attendants" meet each passenger train on its arrival in New York and render any needed service to the disembarking passengers. The service is free, and it will be the duty of these young men to help those who have heavy hand-baggage, to lead a child if necessary, or to assist feeble persons; also to call a cab or direct people to not only the proper line of cars, but to the particular one that will take them to their destination. Among those engaged are a Frenchman, a Dane, an Italian, a Spaniard and a German, all of whom speak English, and the foreigner will be as readily served as the American.

This thoughtful care for the convenience of it patrons is characteristic of the New York Central's progressive management, and it will doubtless be much appreciated, not only by those who have occasion to use the gratuitous services of these attendants, but also by all observing people who like to see evidences of the increasing refinements of railroad management.

Displacing Planished Iron for Locomotive Jackets.

The economies forced upon railroad companies by their reduced earnings are leading to some remarkable changes. One of these is the substitution of cheaper sheet iron for the planished iron used as locomotive jackets from time immemorial. The cheap sheet iron is either japanned or painted. Not only is an important saving thus effected in the first cost of the jacket, but its subsequent care is much less expensive. Planished iron requires constant attention, being frequently oiled and rubbed, taking much of the fireman's time. The japanned or painted jacket falls to the care of the wipers or hostlers in the roundhouses. Numerous Western railroad companies have made the change on freight engines, and some very prominent systems are now extending it to their passenger locomotives. A heavy burden was taken from firemen's shoulders when the extensive use of brass ornamentation on locomotives was abandoned, and this latest step is in the same line, but the prime consideration is not the diminution of firemen's labors, but economy in the cost of maintenance. An important outlet for the production of planished sheet iron is thus being seriously curtailed.—*The Iron Age.*

Coal Consumption on French Railroads.

According to the *Revue Technique*, the coal consumed in 1893 on the railroads of France amounted to 3,782,850 tons, representing a value of about 52,000,000 francs. The following statement shows the amount consumed by the different large roads in the year named:

	Tons.
State Railroads	15,090
Midi Road	272 260
Orleans Road	543,160
Western Road	552,830
Eastern Road	581,580
Northern Road	705,600
Paris, Lyons & Mediterranean Road	975,520
Total	3,782,850

French and German Railroads.

The French Ministry of Public Works has issued an official statement with regard to the mileage of the French railways at the commencement of this year. The total length of lines open for traffic was 22,792 miles, being an increase of 287 miles upon the previous year, while the length of local lines open for traffic was 2,331 miles, or 99 miles more than a twelvemonth ago.

The report of the German Railroad Union for the past year shows that the aggregate length of railroads in the union was 45,880 miles. There is a reported increase of 561 miles during the year. Of the entire mileage 11,453 miles, or about 23 per cent., are double-track roads.

The *Financial Chronicle* computes the gross earnings of 131 railroads for the month of February at $33,303,022 for 1895, against $34,021,368 for 1894, a decrease of $718,346; while the mileage increased from $100,519 in 1894 to $100,-620 in 1895. The earnings of these same railroads from Jan. 1 to Feb. 28 declined from $71,072,925 in 1894 to $70,-367,041 in 1895, a loss of $705,884.

The New York & New England Railroad Company has contracted for 50,000 tons of soft coal at $2.50 a ton, Boston delivery. Last year the company paid $3 a ton and in 1893, $3.25. The saving this year will be about $25,000. This low figure is equivalent to $1.90 in New York and $1.60 in Philadelphia, and it is said to be the lowest price at which soft coal has ever sold on the Atlantic coast.

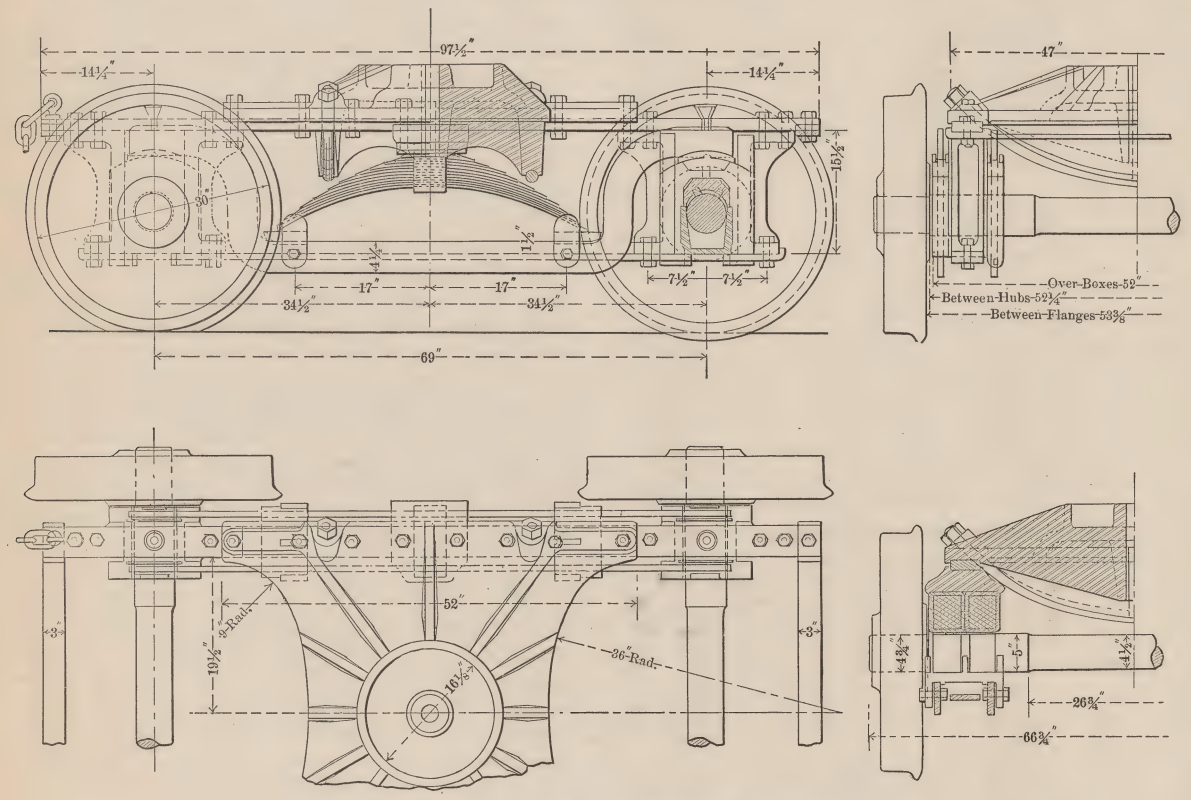
The Southern Railway Company has made a permanent arrangement with the Asheville & Spartanburg and the Spartanburg, Union & Columbia railways by which these two companies will be operated by the Southern Railway at a rental of $40,000 for both roads, the Southern giving to the roads 5,000 shares of common and 5,000 shares of preferred Southern Railway stock. Heretofore the Southern Railway has rented the roads for $80,000.

Standard Engine Truck and Counter-balancing Arrangement, Wabash R. R.

We present herewith, through the courtesy of Mr. J. B. Barnes, Superintendent of Motive Power and Machinery of the Wabash Railroad, drawings and some interesting information of a standard engine truck recently adopted on that road, and of an ingenious arrangement for testing and adjusting the counter-balance of driving wheels.

Our first illustration shows the improved engine truck. Modifications of the design have been in use on the road about four years, and the experience with them has been very satisfactory and has led up to the adoption of the design illustrated as a standard for all Wabash engines.

The principal features of the truck are the exceedingly strong center casting and the lateral truss rods. While the center casting is very strong compared with the usual



Standard Engine Truck, Wabash Railroad.

forms of this casting, yet the increased strength is secured without a very great comparative increase in weight. It weighs about 1,300 pounds and is about 300 pounds heavier than the old style of casting it replaces. The object of adopting this stronger casting was simply to obtain greater strength and security, and to avoid the frequent breakages that occurred with the old form.

The thickness of these castings varies from 1¾ inches at the center of the edges to 2½ inches where the castingcorners rest upon and are bolted to the frames. These places have been found by experience to need additional metal just at these points to prevent their giving way, as frequently occurred with the old style pattern. The ribs or flanges are 2½ inches wide in the center and 1¾ inches wide at the ends, and suitably grooved to hold in place the 1¾-inch truss rods. The flanges are 7 inches deep at the center, and are curved or bow-shaped. The springs used in these trucks have leaves 3½ inches by ⅝ inch, graduated 10 to 11 leaves according to the size of the engine. As to the riding qualities of these trucks and efficiency of the springs, Mr. Barnes informs us that the breakages in 1894 were 54 per cent. less than in 1893.

In the cross-sectional view of the journal-box it will be observed that the brass does not rest on the journal, but is supported on the journal by two metal strips. These strips are of very soft metal and extend clear across the journal. They are a Babbitt metal mixture, one-third antimony and two-thirds lead. It is estimated that their use saves at least 30 per cent in oil, and delays on account of hot engine-truck boxes seldom occur.

The arrangement for testing and adjusting the counterbalance of driving wheels, shown by our second engraving, is in use at the Springfield (Ill.) shops. This is a recently adopted device, which was designed by Mr. Barnes late last year. It has already proved itself to be a valuable and reliable arrangement for testing and adjusting counter-ballance weights.

The following instructions are observed in doing this work:

To Find the Center of Gravity: Make a thin wood template of the balance blocks, showing the center line *A B*. Suspend from any point, as at *C*, and where a plumb line, from the point *C*, intersects the center line *A B* will be the center of gravity.

Revolving Weights: Crank pin hub, crank pin, side rods and back end of main rod.

Reciprocating Weights: Piston and rod, cross-head and front end of main rod.

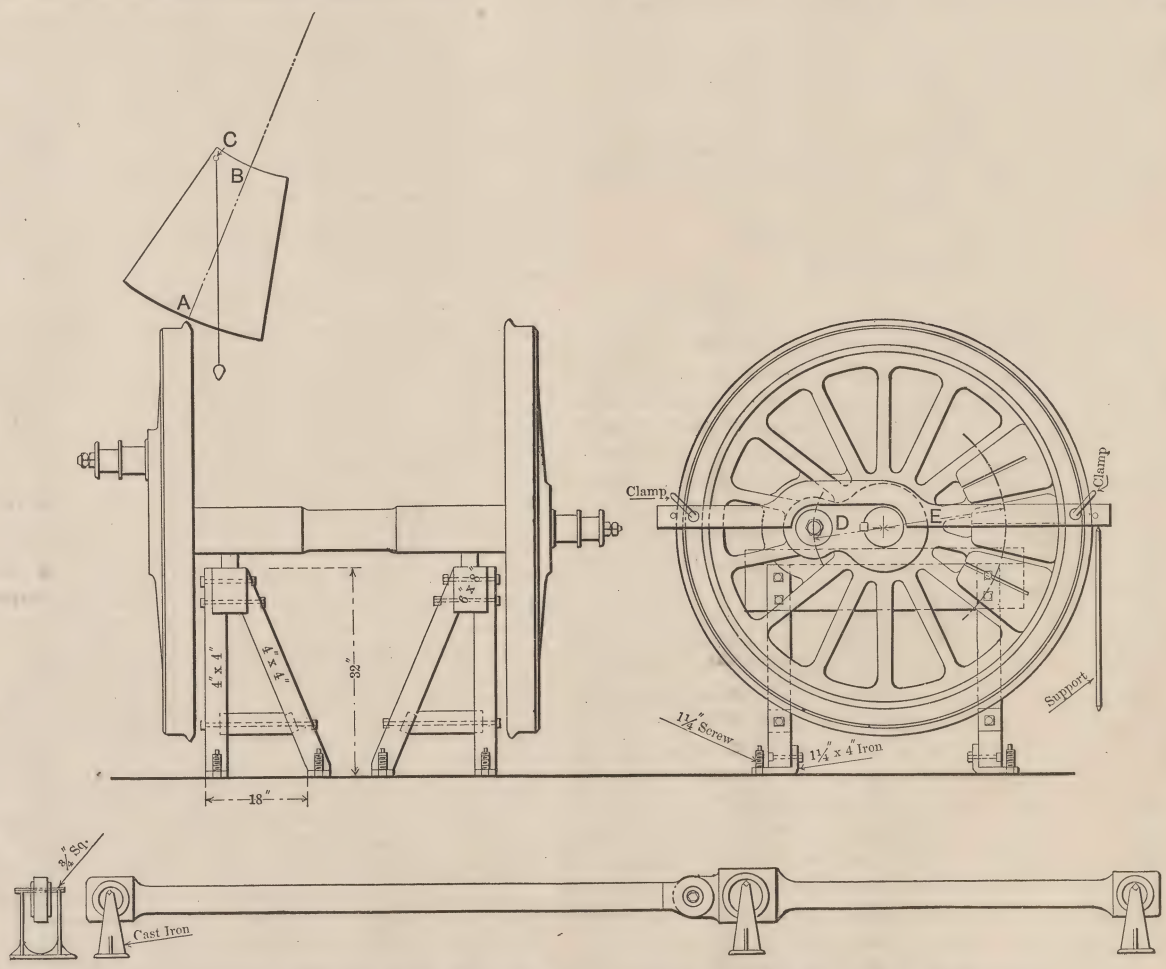
Weighing Rods: Place the rods on the supports, as shown, having all bolts, keys and oil cups in place, and block up under the supports, so that each block may be removed in turn and the weight taken on scales. Main rod to be weighed in the same manner.

Testing and Adjusting Counter-balance: Place the wheels upon the trestles and level up in each direction, having the side which is to be worked on in the position shown, so that a line through the crank-pin and axle centers will be perfectly level. Attach the rods to the crank-pin, supporting the outer ends of the rods so that they also will be level, and suspend such weights from the pin as will represent the proper proportion of the reciprocating weight acting upon the wheel. Then balance the whole by adding to or deducting from the counter-balance.

Each wheel to be balanced for all of its revolving weight and its proportion of the three-fourths of the reciprocating weight. The three-fourths of the reciprocating weight to to be divided among the wheels in proportion to the revolving weight carried by each.

To ascertain the weight to be added to or deducted from the counter-weight, take the surplus or deficient weight as shown at the crank-pin, and multiply by the distance *D*, divide the result by the distance *E*, and the quotient is the number of pounds to be added to or deducted from the counterweight.

The same results may be obtained, without placing the rods on the pins, by clamping a straight edge to the wheel as shown; then, at a point three times the distance *D* from the axle centre, place a support under the straight edge with the lower end resting on scales and note the weight; multiply this weight by three and note the difference between the result and the weight of the rods and the reciprocating parts belonging to the wheel. This difference multiplied by the distance *D* and divided by the distance *E* will give the amount in pounds to be added to or deducted from the counterweight. In order to retain the center of gravity, the additions or deductions must be made to extend over the whole surface of the counterweight.



Arrangement for Testing and Adjusting Counter-balance Weights, Wabash Railroad.

Locomotive Repair Shop Equipment.—I.

BY W. H. WESTON, M. E.

The value of a good machine tool equipment for a railroad repair shop is a matter that should be far more thoroughly considered than it is in a great proportion of places, because on this depends to a very great extent the effective and proper repairing of locomotives, and also the doing of such repairs at the lowest cost when every element of a number of years running is taken into account, or when the total amount of work done by the engine while it runs is figured. If an engine is brought into a poorly equipped shop and the repairs given each time it comes in are of a kind of shiftless nature, that is, in keeping with the poor and insufficient supply of tools, it is sure to give very unsatisfactory and expensive operation when on the road, and will go to the scrap heap much sooner than if kept up each year to a good condition.

Even if it is the disposition of those in charge of such a shop to do the best work on the engines and the necessary amount of repairs, it will hardly be possible to come any where near good results; but it is usually the case that when an improper shop equipment must be got along with, it causes a very marked inclination not only on those in charge, but also on the employees to slight everything and take but little interest in the work of keeping the rolling stock up to a good standard. On the other hand, a well equipped shop that has all the tools necessary for proper work, and tools that are of such quality that the best of work can be turned out, then it is almost invariably the case that everyone will take far more interest in bringing out good work and in keeping things up to as near a high standard as possible.

In supplying a shop with machine tools, it is not only necessary to have a good quality of tool, but the number must be such as to allow all the work that may ever be brought into the shop to be readily accommodated. A shop with an insufficient number of good tools is about as expensive and ineffective as one having a larger number of imperfect and worn out machines.

In either instance the cost of what work is done is high in proportion to what it would be with a proper supply of machinery. As an example: A place spends $75,000 in putting in machine tools for a shop that is going to take care of, say, 150 engines. The interest on this amount at 6 per cent. is $4,500, and any one who is sufficiently familiar with machine work, and competent to form an opinion knows that the saving of $4,500 is an easy matter on the work of repairs, and will be more than accomplished by having efficient machinery to use in place of having to do the work on old and worn out tools, many of them not being adapted to the work as done at the present time; and taking into account the better quality of work turned out, and the consequent keeping of the engines in good order, the saving effected is a large amount.

Notwithstanding all this, the value of a good repair shop equipment is not fully appreciated by railroad officials who are not directly in charge of motive power, but who control the financial affairs of the road and have it in their power to determine all matters of expenditure. This accounts for many shops being poorly supplied with machinery, even when those in charge have been active for years to impress on managing officers the necessity of new ma-

chinery, and the direct advantages that such would give in the economical working of the motive power, and in the total cost per engine mile.

The extent to which indifferent equipments exist throughout the country is very great, perhaps more so even than is generally supposed. While there are some marked examples of shops that are fitted out with a good supply of the most efficient machinery, yet probably one-half of the repair shops in the country are far from being in such a condition as would give a reasonable cost to the work that is done in them. And it may be said also that almost the whole of these shops could be provided with proper and efficient machinery if the money would be appropriated for the purpose; that is, there is an ample chance for the road to buy all the machinery needed if they would. Many roads will spend money for almost everything else, but will let the motive power go until it is hardly possible to keep it out of the scrap heap. And then the result is, eventually, the buying of new engines is so imperative that they have to be procured by the wholesale to take the place of engines that might with good usage have been run for many years. It may be said that all usages made of money by a road are necessary, but yet it certainly is a fact that some are of more importance than others; and it would be far better for the success of the road if in many instances the financiers were more careful in considering the needs of the motive power department.

One direct reason for so many poorly equipped shops is that they were started years ago and the same machinery is still in them that was put in when first built, and as long as it will run and do any work it is kept in use. Possibly the idea of putting in new tools has been settled upon, but it is put off with the expectation of doing it some time, and as long as the old tools can be used they are kept going. This state of affairs exists in hundreds of places. In the greater part of these places it would be economy to throw the old machinery into the scrap pile and buy new, even if the latter were to cost four or five times as much as would be required to purchase it.

(*To be continued.*)

Arbitration Committee's Decisions.

The Arbitration Committee of the Master Car Builders Association held a meeting in Boston, Feb. 13, and passed on cases No. 261 to 278. The members present were: Messrs. G. W. Rhodes (chairman), M. M. Martin, J. W. Marden, John Mackenzie and G. L Potter.

The New York, Lake Erie & Western applied a new brass to a Chicago, Burlington & Quincy box car in transit, and rendered a bill for the same, net 77 cents. The C., B. & Q. claimed that the brass was wrong material, and asked that the bill be cancelled, which the N. Y., L. E. & W. declined. Decision: The N. Y., L. E. & W. failed to comply with the rules by not carding the wrong journal-bearing as soon after the work was done as possible, but according to the circumstances the bill should be paid, and as the C., B. & Q. procured a defect card from another road for wrong material it may render a bill for the replacement.

The Nickel Plate replaced a broken drawbar on a St. Louis & San Francisco car with a $7 wrought iron New York Central bar. The car completed its trip to the Atlantic coast and return safely, but came home with a C. R. R. of N. J. defect card for "one drawbar with pocket one inch too short." This referred to the Nickel Plate's renewal, and proved a bone of contention. The owner removed the bar and refused to pay the Nickel Plate's bill for $6.82 net, claiming wrong material. The committee sustained this claim.

The C., B. & Q. carded a C., C., C. & St. L. car for wrong cast drawbar weighing 201 pounds, entering the weight on the card. Three months later the owner rendered a bill against the C., B. & Q. based on the card and allowing credit for 132 pounds of scrap. The "Q." insisted that its bar weighed 201 pounds, but the "Big Four" stuck to the 132 pounds theory. The committee had to believe both sides, and concluded that someone else must have substituted a lighter bar for the one put in by the "Q.," but that:

"The owner of the car should not be at a loss in making the repairs to damaged parts of its car for which it is not responsible. Therefore the bill should be paid as rendered."

The "Big Four" carded a C., H. & D. car for "one cast drawbar in place of malleable drawbar." On this the C., H. & D. tried to collect a bill for a wrong drawbar, claiming it was too short, but not saying how much. The committee decided against the bill and declared that the disposition of the M. C. B. Association was to allow a good deal of elasticity in the use of link and pin bars.

The D., L. & W. attached to a "Big Four" car a card for "two damaged stringers." Later, the owner renewed two stringers under this car and sent a bill to the D., L. & W. based on the card and renewal. The D., L. & W. objected, saying the card meant *draft timbers* instead of *stringers*, and that inspectors sometimes called draft timbers "stringers." The committee decided that a charge for renewing two stringers is correct.

In 1889 the Nickel Plate carded a Memphis & Charleston car for a cracked intermediate sill. In 1891 the owner had this car in the shop for general repairs, and decided to renew the cracked sill, did so, and rendered a bill in accordance with the Nickel Plate's card. The latter objected on the ground that, as the car had run so long after the card was issued, there must have been further damage to make the removal of the sill necessary. The committee decided that a defect card is "a voucher authorizing work to be done, and unlimited as to time." The bill should be paid.

A New York Central car was destroyed on the L. S. & M. S., and the owner rendered a bill placing the value of the car, new, at $550 without air-brakes. The car had "Buchanan" trucks without iron transoms. The L. S. & M. S. objected to allowing the trucks to be classed under the valuation of metal-transomed trucks. The investigation of the committee showed that:

"Although the truck has no transoms the spring plank is of such heavy channel iron that transoms are not necessary. The truck is heavier, stronger and more expensive to build than many trucks with iron transoms. The intent of the rules clearly is that trucks of such construction shall be classed under the valuation of metal-transomed trucks."

The Kansas City Belt Railway attached a defect card to a line car owned by the Lake Erie & Western, reading "two brake beam safety chains gone; drawhead stem broke." The car was repaired by the owner and a bill rendered based on the card. Objection to payment was made by the K. C. B. on the ground that the tailpin in the drawhead was only slightly cracked, that owners are responsible for such repairs, and that the card was issued simply to facilitate movement. The decision states that "A bad order card is a voucher authorizing work to be done at the expense of the company issuing the card." The bill should be paid.

The Richmond & Danville, now part of the Southern Railway system, attached a card in 1892 to a Montgomery, Tuscaloosa & Memphis car for "one chipped cast draw head." After using the car 22 months with this bar the owner concluded to replace it with the Gould coupler, did so, and rendered a bill for $12.50, based on the card mentioned. Objection to payment was made, and was sustained by the committee.

The Philadelphia, Wilmington & Baltimore unwittingly accepted from some road a Flint & Pere Marquette car with a Janney coupler in place of a Gould, which was standard to the car, and gave a defect card for the wrong coupler. The owner rendered a bill for a Gould coupler, labor and sundries amounting to $14.42, and allowed a credit of $1.13 for the scrap Janney coupler which it had received with a broken neck. The P. W. & B. objected to payment, claiming the full value ($10 for the Janney coupler), stating that the coupler was in good order when applied, and that the F. & P. M. should not have received it if broken without a defect card. The committee sustained the P. W. & B. in its objection and assertion.

A dispute between the Pennsylvania R. R. and the Lake Shore & Michigan Southern over M. C. B. couplers is of such general interest that we publish the facts of the case and decision in full. The number of the case is 227.

In October, 1894, the Pennsylvania Company rendered a bill against the Lake Shore & Michigan Southern, based on defect cards issued by the latter company. Among other charges is a charge against L. S. & M. S. car 23,866, based on card issued by the L. S. & M. S. on October 16, 1894, reading, "One Gould pocket coupler broke in face," and a further charge, based on card issued by L. S. & M. S. on October 6, 1894, and attached to L. S. & M. S. car 11,699, reading, "One Gould pocket coupler cracked two inches in neck."

In billing on these cards the Pennsylvania Company charged in each case:

One Janney coupler casting	$6.25
Labor, two hours, at 20 cents	.40
Total	$6.65
Credit, malleable scrap, 160 pounds at one-half cent	.80
Net charge in each case	$5.85

The L. S. & M. S. returned the bill, calling attention to the fact that the charges were for Janney couplers, whereas the defect cards covered defective Gould couplers, and stated that the Pennsylvania Company should properly make charge for Gould couplers instead of for Janney couplers.

The Pennsylvania Company replies that it does not understand the rules in that way, but that where an M. C. B. coupler of a different type is substituted for that standard to the car the charge should be for the full value of the coupler applied at the rates specified in the price list issued by the secretary of the association, plus the cost of labor applying, and a credit should be allowed for the scrap value of the part carded, plus the value of the new parts of the coupler not covered by the defect card. It admits that it did not make the charge in this way, and had it done so the net charge against the L. S. & M. S. would have been $5.45 in each case instead of $5.85, and it offers to accept a counter charge of 40 cents in each case to correct the matter.

The L. S. & M. S. still insists that its view of the matter is correct, and that it would not be right to charge full value, new, of any coupler in such a case, and credit the parts not used; but that the parts carded, only, can be charged for, provided there is a price given for such parts in the quotation of the manufacturer issued by the secretary.

Decision.—It is evident that those who have framed the rules have endeavored to word their reference to the M. C. B. coupler in such a way that will allow the substitution of any M. C. B. coupler in lieu of the original kind applied to the car. A Janney coupler may therefore be substituted for a Gould coupler on an M. C. B. card, even though the card names defective Gould parts; providing, however, that proper charges and credits, as provided in the rules, are allowed. A card calling for one cracked knuckle would only allow a road making the repairs to charge for the knuckle, if only a knuckle were used; a card calling for one cracked drawbar would only allow a charge for the drawbar, if same kind were used; a card calling for one wrong link-and-pin cast-iron bar in place of an M. C. B. bar would justify a charge of an M. C. B. coupler complete at prices named in the Secretary's semi-annual notices. In case a railroad company making repairs on authority of a bad-order card for a cracked drawbar, or a cracked knuckle of a specified make, should elect to replace the bar or knuckle with one of the M. C. B. type, but of an entirely different make, the rules would clearly uphold the road in its action, and in such case full charge may be made for material used as per official price list, and full credit must be given as per same list for the parts not carded, but replaced.

In the opinion of the committee the interpretation placed on the rules by the Pennsylvania Company is correct and their bill should read as follows:

1 Janney drawbar complete		$10.00
Labor		.40
		$10.40
Cr. Malleable scrap, 160 pounds, at one-half cent	$0.80	
Cr. Parts released in good order at list price	4.15	4.95
Net amount of bill		$5.45

Comments on English Rolling Stock.

Liberal extracts of Mr. F. A. Delano's "Notes on English Railway Practice," read before the Western Railway Club recently, were published in the February and March issues of the National Car and Locomotive Builder. These "notes" were fully discussed at the February meeting of the club named, and some interesting comments on English rolling stock were brought out, and we republish some of these below:

Mr. William Forsyth: The English railway practice, I should think, as Mr. Cleveland would put it, is a condition rather than a theory. Though much of it is behind the times, it is the result of expensive permanent structures which they have, and which they cannot change very well. Their passenger cars seem to me still to be a relic of the stage coach, and their classification of the passenger traffic is something which is gradually being condensed; and that reminds me of one or two stories about the English classes of passenger service. I believe it commenced with the stage coaches, so that, even when they only had one stage, they still had different classes of passengers, and paid different prices for their tickets, when each of them had the same kind of a seat. But when they came to a hill it was found that the first-class psssengers retained their seats, the second class got out and walked, and the third class helped push. There is another one about the second class. A lady and gentleman were riding in a second-class car. The lady was somewhat annoyed, and commenced berating the gentleman, and told him that he did not seem to understand the classes of passengers in England. He said, Oh, yes, he did; he had traveled a great deal and he would explain them to her. He said that in the first class the passengers abused the guard, in the second class the passengers abused each other, and in the third class the guard abused the passengers. I think that the passenger cars in England are certainly behind the times, and that there is nothing to be learned from them, so far as size and mechanical operation is concerned, except the finish. There is some good sense in the inside finish of English cars. As Mr. Delano has explained, they are plainly and simply finished, but very comfortable so far as the seats are concerned.

Mr. G. W. Rhodes: There is a matter I would say a few words on—about the locomotive department. I think that every mechanic admires a fine piece of machinery, and fine finish, but with us in the West that is not the problem at the present time. We may like looking at these handsome things, but we have not the money to spend on them, and the question now before us is how to keep our equipment up to its work, and at the same time be all the service demands of it. The elaborate painting on English locomotives would indicate that they are in much better shape for expenditures than we are on our lines. A short time ago I was traveling in our general manager's car, and in discussing the subject of economies the question of paint came up. We were talking of painting bridges, engines and cars, and I explained that we had done away with varnish on our engines some few years ago, and that in its place we used a varnish paint, which reduced several operations on both engine and tank. The general manager asked why that would not be a good material, as it does not rust and has great durability, to put on bridges. We at once reversed the question and asked why some paint we were talking of for bridges wouldn't be a good thing on locomotives. Afterwards in investigating the matter at our shops we found that the men were doing what we all know is done—rubbing the tanks down and puttying them up and rubbing them off, polishing them, putting on extra coats, and filling coats, and I asked what that was done for. The answer was that it was done to make the paint last. Then the question arose, if it is important that this be gone through with on tanks and parts of engines in order to save them from rust and wearing out, why is it not just as important to put this kind of finish on our bridges? The bridges are more expensive, and it is very essential that they be not allowed to rust anywhere, and you would suppose that the bridge would require the best protection by paint, or, at any rate, more than an engine would; but it finally developed that this extra labor that was put on tanks and engines was not for the purpose of protecting material but for appearance.

As an engine is never shopped on account of its lack of gloss, it would seem as though there might, in these times of pressing economy, be an economy in avoiding putting on this extra labor for appearances. We have turned out one or two engines on our line with simply one coat of bridge paint, costing one dollar a gallon; and I recently examined one of the tanks that had been out about a couple of months, and I could not see any difference from others that had had a great deal more labor and a great deal more material put on. This tank had absolutely no rubbing down or extra finish; it was painted in the same way as a bridge is. If there was any rust it was scraped off, the same as would be done on a bridge, but aside from that it got one coat of paint only.

Tank Cars for Handling Molasses and Syrups.

Up to within a year or two ago oil was the only liquid handled in tank cars; to-day the progressive refiners of syrups are rapidly introducing tank cars for the transportation of syrups, molasses and glucose. Messrs C. W. Goyer & Co., of Memphis, Tenn., were the first refiners to introduce this method of transporting their liquids, and to-day their tank cars move in all parts of the United States, carrying refined syrups in one direction and glucose in the opposite.

After experimenting over a year with different classes of tank cars, this company has recently received from the works of the Memphis Car & Foundry Company the first of a number of model tank cars, one of which is shown in the engraving herewith, which reproduces a photograph sent us by the builders. These cars are constructed of the best sheet steel, double riveted, and are made to carry 5,000 gallons of syrup, which is equivalent to 60,000 pounds, the present M. C. B. standard. The dome and cap at the top of the car are large enough to readily admit a man, the cars being thoroughly washed out after each trip. A double coil of steam pipe, galvanized, is laid at the bottom of each tank, live steam being used to heat the syrup when the cars are being unloaded, with a view to making it run as freely as possible. An outlet 6 inches in diameter is used at the bottom for the purpose of unloading, and to this is fastened a pump, with which the car can be emptied within 12 or 15 minutes.

Until the introduction of tank cars for handling syrups, barrels holding from 500 to 600 pounds were employed, the use of which entailed a heavy loss to the receivers of both refined as well as crude goods, there being an average of 45 pounds of syrup to the barrel absorbed by the staves. Again the expense saved in handling syrups in bulk (as is the case in tank cars), as compared with the cost of handling them in barrels, rolling them in and out of box cars and handling each particular barrel while being emptied, fully justifies the investment in tank cars necesary to transport liquid in this manner.

A Tank Car for Hauling Molasses.

Messrs. Goyer & Company's cars move from their Memphis refinery to the plantations in the South, bringing in crude Louisiana molasses, and out again to the North and West, carrying the same raw and also the refined article to St. Louis, Chicago, Omaha, Philadelphia, New York and other cities using the product. The saving to railroads is a large item, inasmuch as they are no longer subjected to numerous claims caused by loss in defective cooperage, handling light loads because of box cars not being large enough to furnish floor space for heavy loads when in barrels, while tank cars of this size always carry a maximum load.

Plasticity of Fire Clay.

The following remarks on the importance of the plastic quality of clay used to make fire brick were contributed to the *Iron Age* by Mr. Charles Ferry, of Troy, N. Y. They apply particularly to fire clay used in the furnaces of iron manufactories, but are also of considerable interest to locomotive men, since the increasing use of fire brick arches in fireboxes makes this material an important item in the cost of maintaining locomotives, and the remarks of the writer in reference to the destructive action of sudden expansion and contraction of fire bricks are particularly pertinent to locomotive service :

The plasticity of fire clay is a very important property which every fire brick mixture should possess. In very many cases in which certain grades of fire brick have produced exceptionally satisfactory results, the chief reason and secret of their success has been traced back to this particular feature of its mixture. In these instances there is probably no substitute that would have worked so effectually and yielded such satisfactory results. Plasticity never affects burned fire clay disadvantageously, but, on the contrary, it often is the only means through which fire bricks are made capable of enduring the severest sort of expansion and contraction.

The fact is only too familiar to iron manufacturers that the tendency of many grades of fire brick to "chip off" and "waste away," as a result of an unavoidable and sudden "cooling down" of their furnaces, often proves much more disastrous than any loss due to actual fusion of the brick. This emphasizes the necessity not only for the fire brick makers to employ the most plastic clay mixtures for producing fire brick, but for the iron manufacturers and other consumers to conduct their tests of trial lots of brick submitted for their consideration in such an exhaustive manner that they will be as sure of the brick's ability to expand and contract freely as of its refractory nature.

Plasticity of fire clay, or, in other words, that property by virtue of which it is able to absorb water and become formed into a tough, pasty mass, does not depend solely upon its chemical composition, but is quite as closely related to its physical condition. It has been variously explained, but the theory which has become the most generally accepted is that the kaolinite, or essential part of the clay, and upon which its plasticity depends, has a crystalline structure, and when these crystals are perfect the plasticity is the most imperfect, though, as these crystals become broken up by wetting and grinding, the plasticity of the clay increases.

There are the hard varieties of fire clay, characteristic of the Pennsylvania and Maryland deposits—viz., flint, rock, feldspar, etc.—and the soft sedimentary clays which are thoroughly plastic; all being composed of kaolinite (hydrous silicate of alumina, $Al_2O_32SiO_2 \times 2HO$) and quartz, with small varying quantities of lime, magnesia, iron and fixed alkalies. The kaolinite, in the hard varieties of clay, is of a more or less crystalline structure, rendering it much less plastic than the soft New Jersey fire clays, the crystalline nature of the latter having long since been obliterated. The plasticity of the New Jersey fire clays varies directly in proportion to their chemical composition of percentage of kaolinite, which theory is fully substantiated in practice and chemical analysis.

After a green fire brick has been moulded, pressed into shape, dried and burned in a kiln at a white heat, it becomes thoroughly bound together, hard and sound. From a chemical standpoint this bond, which holds the particles of clay together, may be effected by two general reactions:

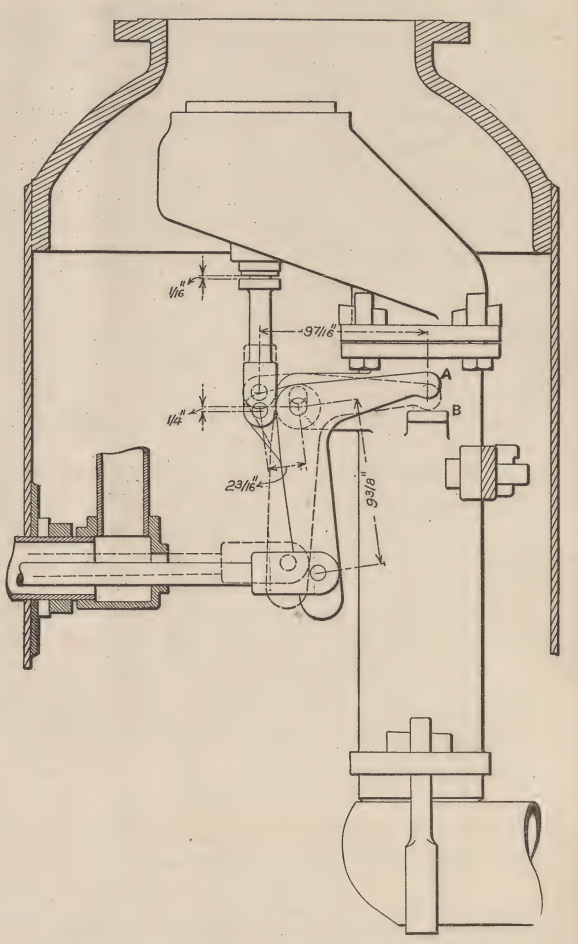
1. Dehydration of the clay base (hydrous kaolinite). 2. Partial fusion caused by accidental impurities, lime, magnesia, iron or alkalies.

Most of the soft New Jersey fire clays contain so very little fluxing impurities that the tough and sound nature of fire brick originating from that locality can only be attributable to the plastic nature of the clay. Brick made and burned from the hard varieties of clay, which become only sparingly plastic even when wet and thoroughly ground, are either so friable that small particles or lumps of calcined clay can easily be picked from their surfaces with the finger nail, or else, if sound and well combined, the bond has been imparted by virtue of impurities through the second reaction. If the hard fire clays are employed, which are never more than partially plastic, the fire brick usually contains enough basic substances to form, under the influence of the intense heat of a kiln, compound silicates, bringing the constituents of the brick into a chemical union. As the heat increases in the kiln, the coarse, porous "green" brick becomes harder and denser, till finally its structure begins to assume a brittle character, and its fracture shows particles of clay with sharp edges almost like glass. I have examined fire bricks that seemed to have approached a vitrified state.

History repeats itself and demonstates the fact daily that fire bricks made from the purest soft plastic clay mixtures, free from impurity and bound together by the kaolinite alone, are best able to endure the effect of sudden and extreme changes of temperature. After they are burned in the kiln their condition still remains thoroughly porous, though the particles of clay are so well combined as to give it a toughness which permits of the greatest expansion and contraction without signs of disintegration. Plasticity, therefore, is a very essential quality to the best fire clays, and without all conditions with the highest degrees of success it cannot be adequately met. Since the fluxing or accidental impurities reduce the refractoriness of fire clay, it makes it all the more necessary that the fire brick should be made from clays containing as little of them as is practicable.

Improved Throttle Valve, Pennsylvania Railroad.

We illustrate herewith an improved throttle arrangement designed by Mr. A. S. Vogt, Mechanical Engineer of the Pennsylvania Railroad, for use on the engines of that road. Its purpose is to facilitate the easy opening of the throttle valve at starting and when the engine is to be moved short distances. This is accomplished by providing a slotted hole for the pivot of the bell-crank, as shown in the illustration. At the start the length of the lever arm



The Vogt Improved Throttle Valve.

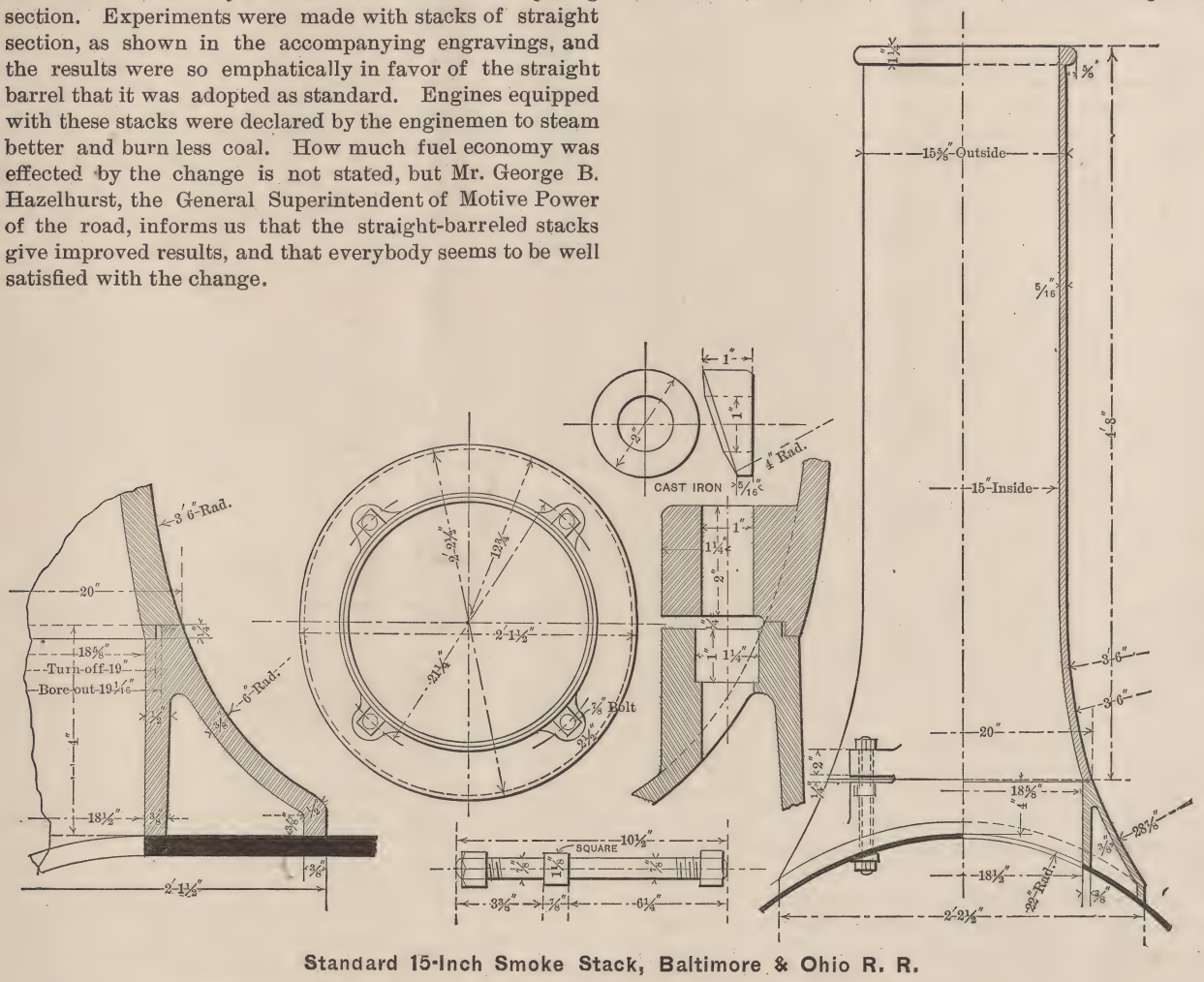
is $2\frac{3}{16}$ ins., while the long arm is $9\frac{3}{8}$, making a ratio of .233 to 1. By means of this large leverage, the valve can be easily and quickly started. After the valve is lifted from its seat, the projecting horn A on the back of the bell-crank comes in contact with the bracket B on the side of the throttle pipe, and the crank takes the position shown in dotted lines in the figure. The end of the horn then becomes the pivot and the length of the short arm of the lever is changed to $9\frac{7}{16}$ inches, and of the long arm to about $11\frac{1}{2}$ inches, making the ratio of the arms, after the valve is started from the seat, .820 to 1. The reduction in leverage is apparent. The slotted hole in the pivot permits the pivot pin to rise as much as is necessary.

General Passenger Agents' Convention.

As announced in our last issue, the 40th semi-annual meeting of the American Association of General Passenger and Ticket Agents was held in New York, March 19. Mr. George H. Daniels, of the New York Central & Hudson River Railroad, delivered the address, and chose as the text for his discourse a part of the sixteeenth verse of the first chapter of Ezekiel: "A wheel in the middle of a wheel." To Mr. Daniel's mind "the outstretched wings" mentioned by Ezekiel are the white sails of ships; the hands under the wings are the toiling millions engaged in the transportation business; the lamps are a myriad of lights that burn on land and sea; the fire represents the countless furnaces; "out of the fire went forth lightning" refers to the electric telegraph, and "the living creatures" that "ran and returned as the appearance of a flash of lightning" means the fast railroad trains bearing the commerce of the nations. "The railroad interest that we represent," he said, "vain as it seems to us, is only 'a wheel in the middle of a wheel.' But when you stop to consider that the world's entire stock of money of every kind—gold, silver and paper—would not purchase one-third of its railroads, you will get some idea of the size of this particular wheel. In the United States there are, in round figures, 177,400 miles of railroad, nearly one-half of the entire railroad mileage of the globe; the passenger earnings of the railroads of the United States for the year ended June 30, 1894, amounted to $421,507,000. A reduction of thirty-two thousandths of a cent in the rate per mile made a loss of $4,440,000 in the passsenger revenue of these railroads last year. A single glance at these figures will impress upon any receptive mind the magnitude of the passenger traffic, the influence it must have upon the other commercial relations of the public, and the necessity for the judicious and intelligent conduct of this important branch of the transportation interests. The passenger department is a more important 'wheel within a wheel' than some have been willing to admit, but no well-informed railway man will deny that an efficient passenger department is an absolute necessity to the proper conduct of the business of a successful railroad."

Standard Smoke Stacks, Baltimore and Ohio Railroad.

A communication from a master mechanic in our February issue very strongly recommended straight-barreled stacks for locomotives, and pointed out that the exhaust should fill the stack from base to top in order to make the pumping action as efficient as possible. The experience of the mechanical department of the Baltimore & Ohio Railroad corroborates the views of our correspondent to a considerable extent. Formerly this road used a stack of a tapering section. Experiments were made with stacks of straight section, as shown in the accompanying engravings, and the results were so emphatically in favor of the straight barrel that it was adopted as standard. Engines equipped with these stacks were declared by the enginemen to steam better and burn less coal. How much fuel economy was effected by the change is not stated, but Mr. George B. Hazelhurst, the General Superintendent of Motive Power of the road, informs us that the straight-barreled stacks give improved results, and that everybody seems to be well satisfied with the change.



Standard 15-Inch Smoke Stack, Baltimore & Ohio R. R.

We are indebted to Mr. Hazelhurst for our drawings and information concerning these stacks. They are made of cast iron and weigh from 265 pounds to 334 pounds, rough, according to diameter. Their average cost is about $3.43 each. The old form of wrought iron stack with ornamental head casting cost on an average $12.56. Thus a saving of $9.13 is effected in the cost of each stack of the new standard. The advantage does not end here, as the cheaper and simpler cast iron stack lasts twice as long as the more expensive wrought iron stack. Concerning its appearance Mr. Hazelhurst says: "I also consider its appearance is better. It gives a more sharp, clear cut appearance to the engine and has a more business like look about it."

Our illustrations reproduce the working drawing of the 15-inch and 18-inch diameter stacks and their bases. There is an intermediate sized stack 16½ inches in diameter. Its construction is exactly similar to the stacks we illustrate.

Telegraphing Photographs.

A means has been invented by which photographs of any object or person may be transmitted by telegraph and reproduced at the receiving end of the line. The reproduction is as yet rather crude and imperfect, but is sufficiently clear to enable any one familiar with the features of the original to recognize them without difficulty.

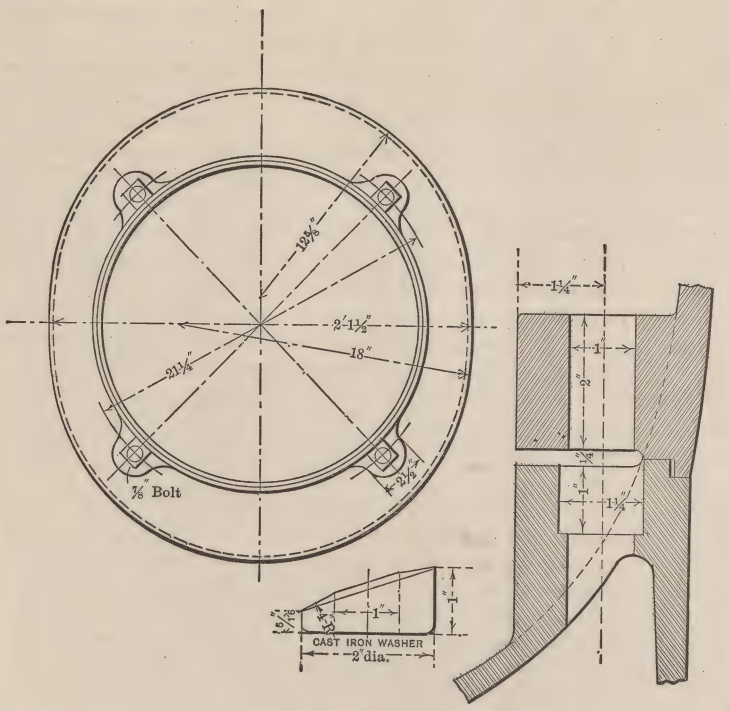
For the telegraphic transmission of photographs there are placed at the dispatching and receiving offices corresponding cylindrical rollers, similar to those employed in the phonograph, the equal and parallel movement of which is insured by a mechanism of clockwork. In contact with the cylinder at the dispatching office is a pencil, the point of which, when the cylinder is made to revolve, traverses it in spiral lines from end to end. The pencil is so adjusted that the strength of the current varies according to the resistance offered to the pencil-point by any variations on the surface of the cylinder. So long as the surface is even there is no variation in the current; but should it present any inequalities the strength of the current varies with its risings and fallings, while the pencil still continues to describe its close spiral lines. This varying current is, by proper electrical means, transmitted to the receiving station, where in its turn it so influences a pencil in contact with the wax-covered surface of the receiving cylinder as to cause it to impress upon it grooves varying in depth according to the changing strength of the current.

In order that a photograph may be thus transmitted, it has first, by the ordinary process of photo-printing, to be converted into a gelatine relief, which is placed upon the transmitting cylinder, which is then set in motion. Following according to the process described the risings and fallings of this relief, the pencil of the receiving cylinder eproduces in close spiral lines a copy of it.

Electric Road Between Niagara Falls and Buffalo.

An electric railroad is to be built between Buffalo and Niagara Falls. According to the plans, the road is to be built of 94 pound steel rails, with side trolley poles. It is to be double-tracked except for a distance of 2½ miles, where the highway commissioners of the town of Wheatfield refused to grant more than a single-track line franchise. This road will give Buffalo and Niagara Falls cheap fares, the rate to be but 50 cents for the round trip at all times. Quick time is to be made, and in order to do this heavy cars are to be used. The running of late cars will keep hundreds of Buffalo people in Niagara Falls until late in the evening, who now are obliged to go home before the really enjoyable part of the day about the Falls comes. The power for operating the road will be furnished by the Niagara Falls Power Company, and according to the contract, the cars will be running by July 1 of this year.

In Niagara Falls the road will be run on the tracks of the local street railway company from Echota, and this line, which is now a single track, will be double-tracked this spring and rebuilt entirely.



Standard 18-Inch Smoke Stack, Baltimore & Ohio R. R.

Mr. Depew's Newest Story.

Dr. Chauncey M. Depew has a new story—one which he won't tell the next time he goes to Chicago. Here it is:

"There was once a prominent man in Chicago who, like all others out there, had a very exalted opinion of his town. He died, and when he reached his eternal home he looked about him with much surprise, and said to the attendant who had opened the gate for him: 'Really, this does great credit to Chicago. I expected some change in heaven.'"

The attendant eyed the Chicagoan a second and then observed: "This isn't heaven."

Wootten Boiler Patent Suit.

The suit in equity commenced in the United States Circuit Court at Trenton, N. J., last year by the Wharton Railroad Switch Company against the Rogers Locomotive Company for alleged infringement of Letters Patent of the United States No. 354,370, dated Dec. 14, 1886, granted to J. E. Wootten for Locomotive Boiler was recently dismissed by order of the Court, at the request of the complainant. This patent is for what is commonly known as the "Wootten Boiler," with a wide firebox having a straight flue sheet without combustion chamber, and contains a single claim, in language as follows:

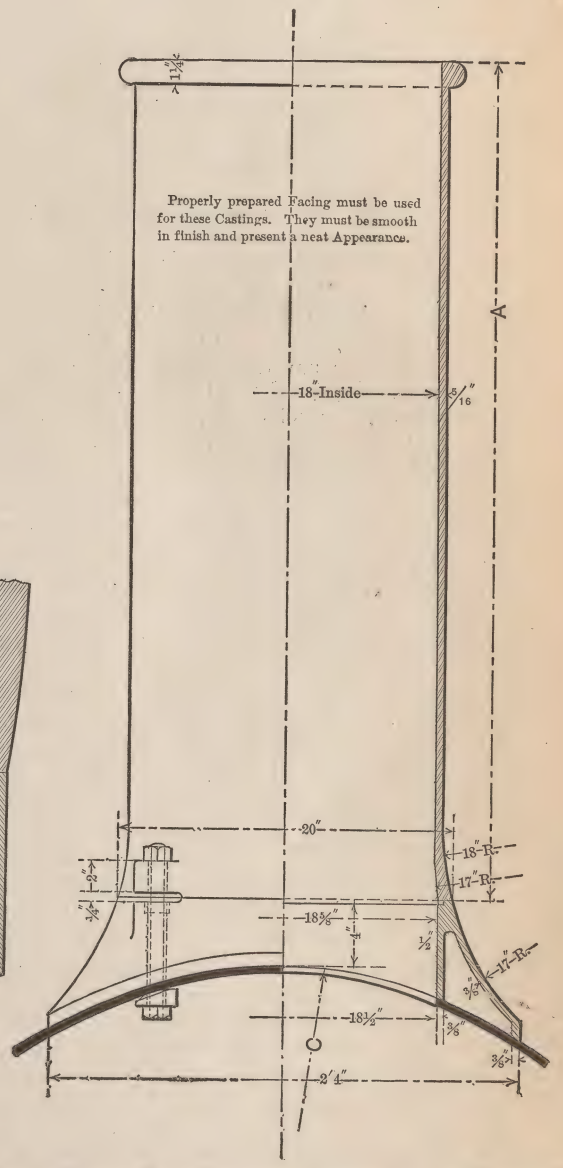
"The combination, in a locomotive boiler, of a waist or shell, a firebox extended laterally beyond the waist and located in such horizontal relation thereto as to admit of driving-wheels being placed beneath it, and a series of fire tubes leading from the flue sheet through the waist, the lowermost row of said tubes being located at such distance above the ordinary grate-level of the firebox as to provide a blank or unperforated area at the lower portion of the flue-sheet sufficient to serve as the forward boundary of the bed of the fuel on the grate, substantially as set forth."

This litigation attracted the attention of a number of railroad companies having in use locomotives equipped with boilers like those complained of in this suit, as undoubtedly similar suits would have been brought against such railroad companies if this patent should have been sustained by the Court.

The Rogers Locomotive Company was anxious to have the validity of this patent tested and had thoroughly invesigated the matter and collected a large amount of evidence to support the defence that this patent is invalid and filed an answer in the suit, setting up such strong defences against the validity of the patent that the Wharton Railroad Switch Company preferred to have the suit dismissed rather than to prosecute it at the risk of having the patent declared invalid by the Court.

Judge Caldwell, of the United States Circuit Court, granted an order Feb. 22 on the receivers of the St. Louis & San Francisco Railroad for $261,336 to be paid the Atlantic and Pacific Equipment Company for rolling stock.

The Seaboard Air Line has acquired the North and West Alabama route, which gives to it an independent line from Atlanta, Ga., to Birmingham, Ala.



The California Manufacturers' Convention, on March 22, refused to adopt resolutions favoring organized labor.

The general offices of the Findley, Fort Wayne & Western will be moved from Findley, O., to Fort Wayne, Ind., April 1.

A syndicate of New York and Allantic City capitalists have formed a company, which is to be capitalized at $4,000,000, to build an electric railroad from New York to Atlantic City.

NATIONAL CAR AND LOCOMOTIVE BUILDER

ESTABLISHED IN 1870.

PUBLISHED MONTHLY

BY

R. M. VAN ARSDALE,

MORSE BUILDING.....NEW YORK.

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APRIL, 1895.

Subscription.—$2.00 *a year for the United States and Canada; $2.50 a year to Foreign Countries embraced in the Universal Postal Union.*

EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING PAGES. *The reading pages will contain only such matter as we consider of interest to our readers.*

Special Notice.—*As the* NATIONAL CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, correspondence, advertisements, etc., intended for insertion must be received not later than the 25th day of each month.*

Contributions.—*Articles relating to railway rolling stock construction and management and kindred topics, by those who are practically acquainted with these subjects, are specially desired. Also early notices of official changes, and additions of new equipment for the road or the shop, by purchase or construction.*

To Subscribers.—*The* NATIONAL CAR AND LOCOMOTIVE BUILDER *is mailed regularly to every subscriber each month. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery, and in case the paper is not then obtained this office should be notified, so that the missing paper may be supplied.* **When a subscriber changes his address** *he ought to notify this office at once, so that the paper may be sent to the proper destination.*

ECONOMIC USE OF COAL IN LOCOMOTIVE SERVICE.

A good deal has been said on this subject within the past few months, and the resulting agitation will certainly prove most valuable to the interests of railroad companies by drawing renewed attention to the need of improved methods in the use of this most expensive supply, the cost of which, even on roads where coal is very cheap, averages over 30 per cent. of the cost of the locomotive service. It is the history of the human race that agitation always precedes reform and is necessary to it; it is also true that a certain amount of agitation of some kind is always necessary to keep alive interest in any matter. The NATIONAL CAR AND LOCOMOTIVE BUILDER has given during the last few years special prominence to matters of locomotive fuel economy, and it seems that at this time it may be pertinent to take a general survey of the whole subject.

Naturally, the first requisite for the economic use of fuel in locomotive service is locomotives so proportioned and equipped that they can utilize to the fullest possible extent the heat of the fire. At the beginning it is well to clinch fast the truth that locomotives are simply heat engines—they are the means we employ for converting the power of the heat given off by the combustion of coal into the actual and useful work of hauling trains of cars. This fact, clearly comprehended, teaches that our efforts to use coal economically must, to be most successful, be devoted to perfecting our methods of generating and using heat to the best possible advantage, and to preventing by all possible ways the escape of heat without its having performed some useful work. Every unit of heat that so escapes is simply the utter waste of the quantity of coal that was burned to generate it, and, of course, the waste of the money that was paid for the coal. Some one said years ago that the best way to *save* was to prevent *waste;* than this nothing can be more absolutely true.

A locomotive properly designed to meet the requirements of economic coal consumption may be briefly described as follows, without entering into any of the always mooted questions of construction: A liberally large boiler, with ample grate area to avoid high rates of combustion, and grates with moderately ample area of air space, fitting well against the ends and sides of the firebox; the largest practicable amount of heating surface in firebox or flues; the longest practicable travel for flame in the firebox to promote the combustion of the gaseous fuel; the freest practicable passage for the escaping gases from the fire, and the exhaust steam from the cylinders to the open air; a boiler kept free of scale, and capable of carrying over 150 pounds steam pressure, and having liberal steam and water space—especially liberal water space to provide for storing heat (a reserve fund) during light work or no work, to be drawn on during the "hard times" of heavy work; driving-wheels as large as the necessities of the case will allow; well distributed weight to give needed adhesion, and well proportioned relative weight and cylinder power; balanced valves, steam tight, and steam tight pistons continuously lubricated; injectors of different capacity and affording the widest possible range of adjustment, certain in action and easy of application; a water-glass, to show both engineer and fireman the height of water in the boiler; a close-notched reverse lever quadrant, to enable the finest possible graduation of the cut-off; the largest practicable opening of throttle-valve and area of dry pipe and of steam pipes in smokebox, in order to get as near boiler pressure in cylinders as possible and as much superheating from waste smokebox gases as possible; a smokestack of such diameter and design that the piston action of the exhausts will be most perfect; and last, but not least, a boiler well and thoroughly lagged, to prevent the needless escape of costly, and therefore valuable, heat.

The tender should have water capacity sufficient to make extra stops for water unnecessary. Nearly all tenders have ample coal space, but one designed to promote the object here considered must have special means to prevent loss of coal while running, either over the sides or out the gangway. The Wabash standard hopper tank is a perfect adaptation of means to this end.

With locomotives thus perfectly constructed and equipped, according to our present knowledge for efficient and economic work, the next important requirement is proper management by the crews. The engineers need our first attention because, contrary to popular belief, they are the men who, instead of the firemen, most affect the coal consumption of the engines. Their methods of using steam and feeding water to the boiler are very frequently radically wrong, and the consequent effect on the coal pile is much more serious than any wasteful habits the firemen may practice. With the improved quadrant our modern locomotives have, no excuse exists to throttle the steam while the engines are running at normal speed (say over 15 miles an hour) and doing normal work. While so engaged, economy demands that there be the highest possible initial pressure in the cylinders, and the shortest practicable cut-off. In stationary engineering there may reasonably be a question as to the economy of this practice when very high pressures are employed in one cylinder, as increased cylinder condensation may neutralize the economy resulting from the more expansive use of the steam, but in locomotive practice it is generally impossible to use a too short cut-off and do the required work, and it is possible that even if there was a loss through excessive cylinder condensation, owing to—*for this reason*—a too short cut-off, that such a cut-off would save coal, owing to the complete dependence of the force of the draft through the fire on the force of the escaping exhaust.

The saving effects of a reduced draft through the always forced fire of a locomotive are as yet unsatisfactorily measured, but are great enough to surprise those who have not given the matter careful consideration. A recent test of a locomotive in the engineering laboratory of Purdue University showed that a rate of combustion of 1,188 pounds of coal per hour evaporated 6.44 pounds of water per pound of coal burned. Doubling the rate of combustion (to 2,500 pounds of coal per hour) reduced the evaporative efficiency to 4.86 pounds of water per pound of coal burned—a loss of 33 per cent. So it is that a ratio of expansion in the cylinders of a locomotive that in itself effects no saving of *steam* may yet effect a considerable saving in *coal* by the resulting decreased draft through the fire, that gives more time for combustion and for the transmission of heat to the water within the boiler, and carries less unconsumed coal to the smokebox and out the stack.

Wrong methods of boiler feeding practiced by some engineers are scarcely less wasteful of coal than the most wasteful use of steam. A good deal has been said by some of the older writers on locomotive running against feeding the boiler intermittently. Their experience had been with the now almost obsolete pumps, and what they cautioned against was the habit practiced by many engineers of carelessly adjusting the feed of the pump while the engine was running and doing normal work, sometimes flooding the boiler, and sometimes giving it a too scant supply, much to the distress of the fireman and loss to the coal pile. These writers also cautioned against pumping the boiler full of cold water while the engine was running shut off. Those who are well informed understand that the advice of these writers was good so far as it related to pump practice, but that it does not apply properly to injector practice. Of course, an over-supply of water while the engine is doing normal work, even when furnished by an injector, will result disastrously to the coal pile, but there is no objection in injector practice to supplying the boiler with slightly less than an equivalent of water while working normally, especially when engaged in extra hard work, and recuperating the supply of water by extra heavy injection while the engine is running shut off or stopping at stations. The constant circulation maintained in the boiler while an injector is working quickly declares any change of pressure, and, as a certain temperature invariably accompanies a certain pressure of steam in contact with water, we may be absolutely sure that by maintaining the pressure we maintain the temperature; and, of course, there can be no evil effects on the boiler with an unvarying temperature. The economic use of coal demands that much care be exercised in boiler feeding, and that the water be supplied mostly while the engine is idle, running shut off, or doing its lightest work; and that when doing its hardest work it be "*favored*" as much as practicable by suspended or reduced injection.

Thousands of tons of coal are absolutely wasted daily on the locomotives in this country because a very large proportion of engineers do not properly understand and practice the methods of using steam and feeding boilers outlined above. Together they constitute a defect in locomotive operating that, if corrected by proper instruction, would save more coal and therefore more money to railroad companies than any other possible reform in locomotive service.

After dealing properly with the engineers, the firemen require attention next. Subordinate to the engineers in position, and in their influence on the management of the engines and use of coal, they yet are an important factor in the problem we are considering. They have many wasteful habits, all of which affect the coal pile. They should be taught primarily the principles of the combustion of coal, and this is specially important on roads that use bituminous coal. Firemen should understand as clearly and thoroughly as any college graduate that heat is the motive power of locomotives, and the steam and its action in the cylinders is simply the means by which that power is utilized. We speak understandingly when we say that any fireman possessing intelligence enough to use good judgment in his work can easily be made to understand this fundamental bit of knowledge of steam engineering. To promote the object of fuel economy we can impart to firemen no more useful information than this. Understanding the principles of combustion, and that heat is the source of their engines' power, they will aim to secure more perfect combustion and therefore a largely increased amount of heat from the coal they burn. The most wasteful habit that firemen indulge results from a lack of knowledge of these matters. The habit referred to is the common neglect to keep the grates free of ashes and the fire light in order to allow the admission of sufficient air to the fire. Many firemen try to keep up steam simply with coal, neglecting through ignorance the fact that the coal is only one part of the fuel of the fire, and that the other equally necessary part, the oxygen of the air, must be admitted through the grates freely to secure the maximum amount of heat with the minimum amount of coal and labor. Probably the next most wasteful habit of firemen is that of carelessly permitting steam to blow off (popping) unnecessarily. If impressed with the fact that such popping is a waste of all the heat derived from the burning of a certain amount of coal (usually between 8 and 9 pounds each time the "pop" blows 30 seconds), they will be more careful to prevent the waste.

Many other careless habits that affect injuriously the coal pile are common among the men who fire and run locomotives. We have not space to even outline these here. Many will suggest themselves to the thoughtful reader; to attain to the most economic use of coal all such habits should be corrected—each one is an enemy to the interests of any railroad company that should not be tolerated.

Education is the best means of accomplishing such correction of wasteful practices. The plan of paying a premium for the most economic service, as followed on some few roads, may be a good stimulant to keep up interest in the matter, but it should only be adopted after all the good results have been obtained that can be from a thorough course of instruction, and the perfecting of the system of keeping records of the performances of locomotives. The employment of traveling engineers, and, in some extreme cases, traveling firemen, is a very excellent method of correcting wasteful habits in firing and running. Some firemen and engineers have not the faculty of correctly putting into practice improved methods that they have not been practically familiar with. They require to be shown *on an engine* what is desired, and how the changed treatment results. For this purpose traveling engineers are indispensable. These should be exceptionally good engineers, practically familiar with the economic advantages of the improved methods they are employed to teach. They should be men of tact and intelligence, and their aim should always be to win, if possible, instead of compel, the obedience and co-operation of engineers and firemen.

With locomotives most perfectly adapted to economic management, and with engineers and firemen following the best methods in their work, "the brunt of the battle" is won, but much remains to be done to assure entire success. The next most important requirement is accurate (and therefore fair and just) records of the performances of locomotives. Exhibits of such records should be posted at least once a month in all principal roundhouses. The influence of such records serves to keep alive interest and agitation, to encourage those who do well and to spur those who do poorly. Evidently this influence is very important, and records should be made chiefly with the aim of en-

hancing it. Many records of this character are based on an improper system, and wherever this exists the result is discouragement to the enginemen and consequent loss of coal. The records should show as near as possible the actual amount of coal consumed by individual engines, and the actual amount of work done with the coal. In pools, or when engines are double crewed, then the records should show the coal used by the respective crews and the work they accomplished. "Miles per ton of coal" has long been justly considered a most misleading basis of comparison, and is fast being superseded by the more accurate but still imperfect "Pounds of coal per loaded car mile" basis. Until we have the "ton-mile" basis of comparison our records will be imperfect, and therefore in some cases unfair and misleading. But no road can too quickly abandon the "miles per ton of coal" basis, for it is not only inaccurate and unjust, but acts to decrease the number of cars per train and to increase the numerous expenses this brings about. On roads that employ this form of record it is to the advantage of engine crews, both in the matter of work and record, to haul as light trains as possible, and they naturally seize every opportunity and improve every means of keeping the weight and number of cars per train down. The "pounds per loaded car mile" basis tends to prevent this, as with this comparison the more cars that are hauled per train the lighter will be the consumption of coal per car mile, therefore enhancing the record of the engines and crews.

Keeping accurate records requires that there be accuracy in noting the amount of coal furnished each engine, and in pools or when engines are double crewed, in measuring the coal left by one crew for another. The prevailing system in regard to this matter is very crude and imperfect. Preferably, the coal should be weighed as it is put on the tenders, and only the amount actually put on should be charged to the engine. Present common practice leaves it to the judgment of frequently careless and generally ignorant coal shovelers to say what number of tons a chute contains. This encourages inaccuracies which are very often aggravated by petty bribes one way and by petty spites another. All should be impressed with the necessity for accuracy in charging coal to engines, and dismissal should follow wilful attempts at inaccuracy either one way or the other. The shrinkage of coal between mines and tenders should not be charged to engines. It is best to know the extent of this shrinkage, and, recognizing it as a loss, seek to discover the cause and the remedy. When we charge the shrinkage to engines we simply shut our eyes to the loss and allow it to continue unchecked. One result is that the number of people along any large road who burn "company coal" exclusively would make a very respectable community in point of size.

Coal should be broken at chutes preferably to egg size unless this is done at the mines, and lumps larger than a man's head should not be put on tenders. In filling chutes the shovelers should be required to pick out all rocks and lumps of impurities they find and throw them aside. The coal that spills from chutes in filling tenders should be gathered up before it is stolen or deteriorated by exposure, and chutes should be kept in condition to reduce this spilling to a minimum. If the spilt coal is used in other than locomotive service it should be charged to what it is used for. When possible, the same kind of coal should always be furnished the locomotives on the respective divisions where they run, because the draft arrangements of the engines must necessarily be adjusted to properly burn the hardest-burning coal furnished, and when an easier-burning coal is supplied the engines it is burned disadvantageously because of the, for it, too strong draft.

So far we have considered the the influences of the methods of work of those connected directly with the operating of the engines. As seen, the ramifications of these are very extensive, but unfortunately they do not complete the list. Passing to the train department we must charge superintendents, trainmasters, dispatchers, conductors, yardmasters, brakemen and switchmen with very often unnecessarily and injuriously affecting the coal pile. Overloaded engines that have to double hills and delay their own and other trains involve the company in considerable loss of coal. Each double may cost anywhere between a half and a whole ton of coal more than to have gone up the hill but once, and each delay of 15 or 20 minutes may cost anywhere between 500 pounds and a ton of coal, according to whether it is winter or summer, and whether the time must be made up under difficulties or not. Time cards are too often made up regardless of the topography of the road, and the ease or difficulty with which trains can be handled on different portions of it. Attention to this that will even the time up consistently with the desired average speed, and the economic working capabilities of the locomotives, will remedy what now is on many roads a source of much waste of coal. Train dispatchers are responsible for waste of coal when they stop trains unnecessarily to give them orders, and when, by errors of judgment in issuing orders, they delay instead of facilitate the movement of trains. All miss-moves of engines or trains on the road or in the yards cost shovelfuls of coal. All who are connected with the movements of engines and trains should be required to bear this in mind and avoid unnecessary movements.

NORTH AMERICA FOR NORTH AMERICANS.

In spite of all the advice that has been given to the contrary, it yet appears that there are many experienced train and enginemen who feel that there is not room enough in this country for them to develop and become what they ought to be. Most of these have a hankering to go to South America or some other far-away country. Distance, we are told, lends enchantment to the view, and these men, viewing with their mind's eye the conditions of work and living in a distant country, see many pleasant things, among the chief of which being high wages, light work and early promotion to official positions. Actual contact with the living and working conditions in the land of promise generally very quickly and cruelly dispels the enchantment. Wages rule lower everywhere in the world than in the United States of North America, and while it is possible in tropical and semi-tropical countries to exist on a small money outlay, yet to live in even a semblance of the comfort that we do in this country, a larger expenditure of money is necessary. Diseases and discomforts to which we are peculiarly susceptible are rife in such countries, and much that we regard as simple necessities of life are absolutely unobtainable there.

We are led to refer to this matter again on this occasion because the following advertisement has appeared in several papers lately:

"Wanted locomotive engineers, firemen, conductors and brakemen, to go to South America. Those having had long experience, who can furnish first-class references, may address Southern Construction Co., etc., etc."

A great many railroad men have written to the "Southern Coustruction Co.," and all have received in reply a letter requiring a deposit of $2, and promising salaries for engineers varying from $90 to $175 per month, according to grade of service, etc. The advertisers are not known, and it is probable that they never will be to those most interested. It is not surprising that a swindling scheme of this kind should be started here, but it is surprising that so many railroad men would take such an evidently artificial bait as we learn have swallowed this. It shows that the desire to seek new fields is strong with many. This is regrettable, and will prove so to none more than to the majority of those who act on the desire. However considered, the conditions of railroad work in this country are far superior to that of any other country in the world, and especially so when compared with such work in South America. Few engine runners there draw over $75 a month salary. The system of operating the roads and maintaining the motive power is in most cases sadly imperfect; and the services of runners being lightly valued, their treatment is correspondingly severe and lightly considered. Promotion from the ranks is rare, the official positions being generally filled by men of experience from the country where the railroad is owned (generally from England), by relatives of influential people, or by political favorites. Ability or deserving service stands a poor show of recognition or reward.

The opposite of all this is true of our railroad service at home. Here the path of promotion is open from the shop or the scoop to the managers's or the president's chair to men of the right stamp. Numerous incidents could be cited of such promotions, and they are constantly going on. To trade off such prospects for a dream is like selling one's birthright for a mess of pottage. Nothing but loyalty to the interests one serves, and zealousness to advance such by careful and intelligent work and well-directed labor, can win success in any field of employment. In no field are such qualities more quickly recognized and appreciated and bound to win advancement than in the railroad service of this country. Those in that service who are possessed of such qualities, and are willing to exercise them, can find here their greatest possible success. Those who have not or are not willing to exercise such qualities will meet success nowhere on the face of the earth.

Literature.

Harper's Magazine for March contains many interesting articles of the usual excellence characteristic of this magazine. Of these we select for special mention as being of more than usual interest to our readers, "The Trial Trip of a Cruiser," by William Floyd Sicard, six illustrations; "The Industrial Region of Northern Alabama, Tennessee and Georgia," by Julian Ralph, eighteen illustrations.

King's Handbook of New York City. Moses King, Boston, Mass. Price $2.

New York is such a vast city and so full of places of interest, whether considered in connection with the history of the United States or simply for what now occupies the ground, that even to people who have lived in the city many years much must remain unknown unless they have some special means of information. This information King's Handbook of New York City is designed to supply, and it does so in a pleasing and graphic manner. The book contains 1,008 pages of historical and descriptive matter, and these are illustrated by 1,029 reproductions of photographs. The book gives a good history of the city up to the present time, and will certainly prove interesting to all who are interested in New York City.

Catalogue of Books on Steam, Steam Engines, Machinery, Mechanics and Mechanical Engineering. D. Van Nostrand Company, 23 Murray and 27 Warren streets, New York.

We have received from the publishers a catalogue of scientific books on the above named branches of mechanics. It is, without doubt, the most complete list of books of this character published in the world, and will be sent gratis on application. Messrs. Van Nostrand design issuing the new edition of their complete catalogue of scientific books in sections, of which parts 1, 2 and 3 are now ready. The others are in preparation, and will be issued in the order named.

Part 1. Steam and Mechanical Engineering.
Part 2. Electricity and Magnetism.
Part 3. Chemical and Physical Science.
Part 4. Civil Engineering.
Part 5. Manufactures and Industrial Arts and Processes.
Part 6. Geology, Mineralogy, Mining and Metallurgy.
Part 7. Hydraulics and Water Supply.
Part 8. Astronomy, Meteorology and Navigation.
Part 9. Architecture, Building, Carpentry and Decoration.
Part 10. Shipbuilding, Naval Architecture, Yacht and Boat Sailing and Building.
Part 11. Drawing, Painting, and Photography.
Part 12. Mathematics.

The New York Central to Try Electricity Instead of Steam Propulsion on a Branch Road.

It was announced on March 26 that the New York Central & Hudson River Railroad has decided to change its motive power on the Niagara Falls branch from steam to electricity, and that the trolley system will be used. Orders have been issued to begin making the change at once, and every effort will be made to have the road in working condition for the summer excursion travel. It is supposed that the power will be furnished by the Niagara Falls Power Company.

Mr. H. Walter Webb, Third Vice-President of the road, says that the company has no idea of extending the use of electricity instead of steam to its other branch lines.

Locomotive Boiler Explosions.

Two disastrous boiler explosions occurred during March. The first on March 2, on the Central of Georgia, in which the engineer and fireman were killed, the engineer's body, it is said, being blown 200 feet into the air, and the fireman's body being hurled 300 yards through the woods. Mr. T. B. Irvin, the Master Mechanic of the road, has kindly favored us with the following information in regard to the engine and the most unfortunate occurrence:

"The engine was a 20 inch by 24 inch consolidation, and had recently been thoroughly overhauled. The boiler was closely inspected, and all defective staybolts renewed, besides getting a new set of flues.

"At the time of the explosion the engine was on through freight and had a full train, and had drifted down a grade two imiles long. The supposition is, that the explosion occurred just after the engineer gave the engine steam to ascend the approaching hill. As the engineer and fireman were instantly killed it is impossible to determine the quantity of water in the boiler at the time of explosion. The remnants of the boiler have been critically examined by experts, and their verdict is that low water in the boiler caused the explosion."

The second explosion occurred on March 9th, on the Pennsylvania Railroad, near Harrisburg, Pa. The engine involved was hauling a west bound passenger train, and the disaster occurred about half-past three in the morning. The fireman was killed and the engineer was seriously hurt, but will recover He states that the boiler at the time of the explosion had 160 pounds steam pressure, and was about two-thirds full of water.

The first sailing vessel to be lighted by electricity is said to be the Spanish bark "La Vigusea," a bulk-oil and general-cargo carrier. She is fitted throughout with incandescent lights, the power for the dynamo being furnished by a small oil engine, which also furnishes power to pump her oil cargo when she is loading or unloading.

Most persons have had occasion to sometimes be surprised at the durability of chalk marks. Such marks have been known to exist many years and be quite legible when they formed figures or letters. Seventy-three years ago a bridge was built over the Big Gun Powder Falls, near Baltimore. When the bridge was erected several persons wrote their names thereon with chalk, and these can easily be read at this day, and the date, July 4, 1822, is quite plain.

The story is told that Miss Helen Gould, eldest daughter of Jay Gould, is largely responsible for the fact that the Gould estate continues to hold the floating debt of the Missouri Pacific, thus preventing what would otherwise undoubtedly be a Receiver-ship. She was moved by the fact that the Missouri Pacific was her father's pet property and was so intimately connected with his name during all the later years of his life, and she was unwilling, even at a possible pecuniary sacrifice, to have tho property go into the hands of a Receiver. Of course, the Gould sons entered into this feeling also, but it is said to be true nevertheless that Helen Gould was the moving spirit in the matter.

Personal.

Mr. James Maglenn, Superintendent of Motive Power of the Seaboard Air Line, has resigned.

Mr. J. J. Coleman has been appointed General Manager of the Wisconsin & Michigan Railroad, with offices at Menominee, Mich.

Mr. C. H. Barnes, Division Master Mechanic of the Boston & Albany, at Springfield, Mass., has been transferred to Boston.

Mr. George W. Thompson, President of the Ohio River Railway, died at Washington, D. C., Feb. 26, from an acute attack of pneumonia.

Mr. E. W. Hayes, Master Mechanic of the Ft. Worth & Denver City, has been appointed Superintendent of Motive Power of the same road.

Mr. John F. McIntosh has been appointed Locomotive Superintendent of the Caledonian Railway, to succeed Mr. John Lambie, deceased.

Mr. M. V. B. Edgerly, President of the Des Moines & Kansas City, died in New York City March 18. He was also a director of the Boston & Maine.

Mr. P. W. Resseman has been appointed General Superintendent of the Ottawa & Gatineau, with offices at Ottawa, Ont., vice J. T. Prince, resigned.

Mr. Scott Mills, Master Mechanic of the Lehigh & Hudson River Railroad, in New York, has recently resigned that position. He has held that office since 1881.

Mr. E. C. Osborn has been appointed Acting General Manager of the Poughkeepsie & Eastern, with office at Poughkeepsie, N. Y., vice W. N. Sheldon, deceased.

Mr. Robert Harris, Traveling Engineer of the Chesapeake & Ohio from Hinton to Clifton Forge, W. Va., has been appointed a Division Master Mechanic.

Mr. T. D. Stanton has been appointed General Manager of the Fountain Head R. R., with headquarters at Knoxville, Tenn., succeeding Mr. M. O. French, resigned.

Mr. George A. Miller has been appointed Acting Master Mechanic of the Jacksonville, St. Augustine & Indian River Railroad, in place of Mr. E. T. Silvius, resigned.

Mr. David Clark, Master Mechanic of the Lehigh Valley, at Hazleton, Pa., has resigned and retired from active railroad service. He is succeeded by Mr. Phillip Wallis.

Mr. John M. Egan, formerly chairman of the Chicago General Managers' Association, has been appointed Receiver of the Oregon Short Line and Utah Northern Railway.

Mr. W. H. Taft, who has been Acting Superintendent of Motive Power of the Boston & Albany Railroad, has been appointed Purchasing Agent, with headquarters at Boston, Mass.

Mr. William R. Meed has been appointed Superintenden of Motive Bower and Machinery of the Seaboard Air Line, with offices at Raleigh, N. C., succeeding Mr. James Maglenn, resigned.

Mr. John Preston, formerly Master Mechanic of the Puebla shops of the Mexican Inter-Oceanic, has been transferred to Vera Cruz, where he has charge of the locomotive and car departments.

Mr. Phillip Kissam, President of the Findlay, Fort Wayne & Western, died recently in New York. He was chosen President of the road a few months ago as representative of the Astor interests.

Mr. John Ireland has been chosen President of the San Antonio & Gulf Shore, in place of Mr. G. G. Clifford, who has been made Vice-President and General Manager. Headquarters, San Antonio, Tex.

Mr. W. W. Willock, of Allegheny, Pa., has been appointed General Manager of the Monongahela Connecting Railroad, with headquarters at Pittsburgh, Pa., to succeed Mr. W. C. Quincy, deceased.

Mr. F. W. Chaffee, foreman of the West Albany Car Shops of the New York Central & Hudson River Railroad, has been appointed Master Car Builder of the Eastern division to succeed Mr. L. Packard, deceased.

Mr. George Dickey has been appointed General Master Mechanic of the Chesapeake, Ohio & Southwestern Railroad at Paducah, Ky. He was formerly Master Mechanic of the Illinois Central Railroad at Water Valley, Miss.

Mr. William S. Hessman, formerly Division Master Mechanic of the C., H. & D., at Dayton, O., has been appointed Master Mechanic of the Illinois Central, with headquarters at Water Valley, Miss., to succeed Mr. George Dickey, resigned.

Mr. S. W. Jeffery, Division Master Mechanic of the Webash Railroad, at Springfield, Ill., has resigned on account of ill-health, and is succeeded by Mr. George W. Mudd, formerly General Foreman of the shops at Fort Wayne, Ind. At the present time Mr. Jeffery is in Las Vegas, N. M., recuperating.

Mr. S. R. Tuggle, Superintendent of Motive Power of the Chesapeake & Ohio Southwestern, has resigned to accept the same office on the Houston & Texas Central, succeeding in that capacity Mr. J. McGee, Master Car Builder of that road, who has been Acting Superintendent of Motive Power since last August.

Mr. F. W. Mahl has been appointed Mechanical Engineer of the Southern Pacific Company, with headquarters at Sacramento, Cal. In addition to such duties as may be assigned to him by the Superintendent of Motive Power and Machinery at Sacratomento, he is especially charged with the details appertaining to the establishment and maintenance of common standards for the motive power and rolling stock of the leased, proprietary and affiliated lines of this company.

Mr. T. B. Purves, Jr., Master Mechanic of the Boston & Albany, at Boston, has been appointed Superintendent of Motive Power of that road, with headquarters at Springfield, Mass., succeeding Mr. W. H. Taft, appointed Purchasing Agent. Mr. Purves is a prominent member of the American Railway Master Mechanics' Association, and a hard worker in the matters of investigation carried on by it. He was chairman of the committee that rendered the very valuable report to the last convention on the Cracking of Back Tube Sheets, and is now chairman of the committee on the relative merits of pneumatic and electric tranmission of power in railroad shops. His promotion is well deserved, and is sure to prove of value to the interests he will serve.

The Corning Shops of the Fall Brook Railway.

The Fall Brook Railway operates 257 miles of road and has 78 locomotives and 3,209 cars, and runs from Lyons, N. Y., on the line of the New York Central, to Williamsport, Pa., on the line of the Philadelphia & Reading. It traverses a thickly populated country and its normal traffic is very considerable. The main shops of the road are located at Corning, N. Y., about midway between the terminals named. Mr. William A. Foster is Superintendent of Machinery and Mr. Charles R. Williams is his assistant, with direct control over the Corning shops. The car equipment of the road is in charge of Master Car Builder C. J. Butler. Both the car and locomotive shops are situated at Corning. These shops are one of Corning's first landmarks and the erection of the original buildings date back to the infancy of the city, they having been built by the old Buffalo, Corning & New York railroad in 1853. The Hon. John Magee afterward added to the buildings, making them the shops of the Corning & Blossburg railroad. Subsequently the shops were leased to the Tioga Railroad company, which occupied them 10 years. The Fall Brook Coal Company took possession in October, 1862. The shops then occupied a lot of eight acres, owned by the company, at the lower end of the village, including also 16 dwellings, afterward erected and occupied by workmen and their families and are so occupied at the present time. This company and its successor, the Fall Brook Railway Company, have since made extensive improvements and additions. The entire plant is heated by steam, lighted by gas and electricity, and equipped with ample water supply.

The locomotive shop is equipped with numerous pneumatic and hydraullc special tools for economizing labor and time. In the last 15 years the payroll has increased from eleven to fifty thousand dollars, and the number of locomotives from 20 to 78.

The number of acres covered by the shops, buildings and yards is fourteen and one-half, which includes the "Magee Row" of tenements and lots, occupying about three acres. The total amount of ground space covered by all the buildings is 120,000 square feet, or nearly three acres. Entrance to the shops is from Tioga avenue. The general office is the first building approached, a good sized one of brick, two stories and basement, standing about fifty feet back from the street.

About 40 feet beyond the office are the supply storehouses of two stories and a cellar. Here, no doubt, is the biggest hardware store in the town, and not only hardware, but dry goods and groceries. The variety and extent of the stock in trade embraces everything from a rattailed file to a locomotive headlight, and from a barrel of crackers to rolls of muslin. Snugly stowed away in a cupboard is a diminutive apothecary outfit, for emergency use in case of accident to an employee. The buildings mentioned are supplemented by a detached oil house, and farther away is a long row of store sheds and an extensive castings platform for the storage of castings, sheet metal, car couplings, etc. There are also large lumber yards and sheds for covering the manufactured grades. In the central part of the premises rises the new engine house, capable of housing 22 engines. A large turn-table occupies the space in the center. There are, besides, engine houses Nos. 2 and 3, and a turn-table of smaller dimensions farther to the north, which were formerly known as the Morris Run roundhouses.

The machine shops, 150x150 feet are mainly of brick and additions from time to time have been made to accommodate increasing business, at the same time the accommodations are worked to their fullest capacity in order to meet the requirements upon them. There are six pits, which will hold a dozen engines while in process of general repair, and that number can usually be seen, partly dismantled, with busy workmen about them, inside and outside, "doctoring" the iron horse for physical ailments, or fortifying its system against future complaints. As before stated, Mr. Charles R. Williams oversees in detail the different parts of this establishment. Though comparatively a young man Mr. Williams has held this responsible position for seven years, being appointed Assistant Superintendent of Machinery in 1888.

The general car shops—75 by 175 feet—front on a line with the machinery and blacksmithing buildings. They accommodate five tracks, containing two cars each. They are well furnished with the required complement of woodworking tools. Here freight or passenger cars are occasionally constructed or refitted, and repairs constantly made to the passenger car equipment, of either the Fall Brook or foreign roads. These shops have, within a year, constructed two very fine baggage and mail cars, as well as remodeled three passenger coaches in the best possible shape and condition. All Fall Brook cars rebuilt and all new rolling stock are equipped with Gould couplers and Westinghouse air-brakes. Master Car Builder C. J. Butler has general supervision of the car department. Mr. Butler dates his commencing services with the Fall Brook back in 1858. Mr. A. J. Etheridge is the General Foreman of the car shops.

A short distance to the north of the car shops is a long building, 40 by 250 feet, extending east and west. This is the car repair shop for the overhauling of freight cars. Two tracks lead into the building which usually are occupied by 10 or 15 cars undergoing repairs. Ample equipment and labor-saving hoists are conveniently at hand. Mr. James H. Spencer is the energetic foreman of this department, and is a seventeen-year-old employee. On the north of the repair shops a long trestle has just been erected for the storage of coal. Toward the upper end of the shop yards is located the paint shops, 40 by 260 feet. There are two tracks running through the building, with entrance or exit from either end, one track for locomotives and tenders, the other for freight and passenger cars. Connected with the car department is the "dead house," a large structure, 30 by 200 feet, open at both ends, containing two tracks upon which passenger and baggage coaches are placed for cleaning at the end of each trip. About $400 a month is spent here in cleaning passenger coaches.

The question of protection against loss by fire is met by every possible provision of modern invention. These are only supplemented by the organized company, composed of shopmen, who are thus familliar with locations and the prompt working of all the fire apparatus. Known as No. 5 in the Corning fire department, this company occupies a neat hose house fronting on Steuben street. Fortunately their services are seldom in requisition, but the members are always alert. Adjoining the machine shops is an extension, in which a large amount of the brass castings used are cast. Near the brass foundry the tinsmiths hold forth, and the tintinabulations of their industry is of no small moment in the general makeup of the rolling stock and stationary equipment of the road. Mr. Joseph Wright is the foreman, and he is said to be the right man in the right place.

Mr. William A. Foster has been Superintendent of Machinery of the road since 1885, when he succeeded Mr. O. C. Patchill, Sr., deceased. Mr. Foster has steadily held the esteem of the managing officers ever since, as well as secured the respect and good-will of the men under his management by his careful consideration of their interests. He was born at Brattleboro, Vt., Feb. 10, 1835. He entered railway service in October, 1852, as a fireman on the old Vermont & Massachusetts road; from June, 1853, to March, 1857, machinist in repair shops; from March, 1859, to April, 1861, locomotive engineer; from April, 1861, to June, 1864, foreman ef repair shops; from June, 1864, to January, 1873, locomotive engineer; from January, 1873, to April, 1885, Assistant Superintendent of Motive Power of the Fitchburg railroad, and for 18 months of this time was Acting Superintendent of Motive Power. Since July, 1885, he has held his present position.

A Tyrannical Motion.

An old Kentuckian became a member of the legislature of his State, and was much annoyed at the regular motion to "dispense with the reading of the journal." The Louisville *Courier-Journal* was gospel to him, but every day in obedience to the motion he laid his paper aside, saying nothing, until his patience was finally exhausted, when he rose to protest as follows:

"Mr. Speaker," he said in thunder tones, for he was hot, "I rise to a p'int of order. Fer two weeks er sich a matter I have sat in my seat in this place peaceful and listenin' to what is goin' on around me and larnin' the ways. Every mornin', Mr. Speaker, about the time I git to readin' uv my copy uv the Cooyah Journal up jumps some republican and moves to dispense with the readin' uv the Journal. In all this time, Mr. Speaker, I hain't never heered a single member movin' to dispense with the readin' uv the Louisville *Commercial*, and I'm gettin' tired uv sich tyrannical oppression, Mr. Speaker, and I move to lay the matter on the table so's we kin go on with our readin' uv the Journal in peace."

The Cotton States and International Exposition.

We are to have another World's Fair during the coming autumn. The name of "The Cotton States and International Exposition" has been chosen, and 500 men are now employed on the grounds at Atlanta, Ga., where the fair is to be held. It will be opened September 18, and will close Dec. 31. The buildings are expected to be completed in June. The most delightful season of the year has been selected for holding the fair, and it will doubtless prove a great success, characterized as it surely will be by the admirable zeal and energy of the "New South."

The site selected for the exposition is Piedmont Park, a natural amphitheatre inclosing about 189 acres, two miles or so from the center of Atlanta. The fairgrounds will be reached by Peachtree street, which is the fashionable thoroughfare of the town, and for a mile or more is lined on either side with fine houses. An electric trolley line runs to the park on this street, but the Southern railway, whose tracks pass the grounds, expects to furnish all the transportation needed for a five-cent fare. The Southern Railway bears a similar relation to the Cotton States Exposition that the Illinois Central did to the Columbian Exposition, and is putting in new tracks for the purpose of running trains on quick schedules.

Excavation is being made for a lake of 30 acres, winding around among the buildings in serpentine fashion. It will be covered with electric launches and gondolas similar to those used at Chicago during the Fair. There are to be 11 great buildings to shelter the classified exhibit. The manufactures building is to be 216 × 370 feet, and the transportation building 126 × 413, and the art gallery 100 × 245. The women have a building to themselves 100 × 220 feet, and the negroes likewise 100 × 300 feet in size. The designs of most of them are artistic, and several are intended to be permanent.

A separate building will be put up adjoining the manufactures building for the accommodation of railway exhibits, and the Pullman Company, the Southern Railway Company, the Chicago & Eastern Illinois and the Evansville & Terre Haute have announced their intention of making extensive exhibits. The Wagner Palace Car Company and several other railroads are also expected to be represented. The Midway Plaisance is to be repeated, with many additions and improvements.

Mr. Edmund A. Felder, who was an assistant in the department of admissions at Chicago, has charge of the concessions, which are to be managed on a somewhat different plan. Those which are not easily regulated, and upon which the percentages would be difficult to collect are to be sold outright at auction, with a minimum price and a space rental for the number of square feet occupied, while the percentage plan is to be applied only to such as charge an admission fee. No space is free. Every exhibitor is charged $1 a square foot for the area he occupies, and pays six cents a hundred weight for terminal charges; but there is no restriction upon the sale of merchandise for delivery at the close of the exposition or by sample while it is in progress. The department of publicity and promotion is in charge of Mr. W. G. Cooper, an experienced newspaper man who understands his business and is allowed much latitude.

There will be numerous official foreign exhibits. Brazil, Mexico and the Argentine Republic will make fine displays, and several other American republics have signified their intention to attend; and there will be large commercial exhibits by manufacturers and merchants from at least five of the Europoan nations—England, Germany, France, Austria and Italy.

The United States Government exhibit will in a measure duplicate that at Chicago. Twenty thousand dollars has been appropriated for a building and $200,000 to pay the expense of collection and installation. Some of the States have appointed commissioners, but most of the exhibitors will come as individuals. The commercial feature is more general than was the case at Chicago, and the purpose of exhibitors will be to extend the sale of their goods rather than secure awards for excellence.

The Westinghouse-Boyden Air-Brake Decision.

On March 11, 1895, Judge Morris, of the Circuit Court of the United States for the district of Maryland, handed down an opinion in the suit brought by the Westinghouse Air-Brake Company, of Pittsburgh, against the Boyden Power-Brake Company, of Baltimore, in favor of the Westinghouse Air-Brake Company.

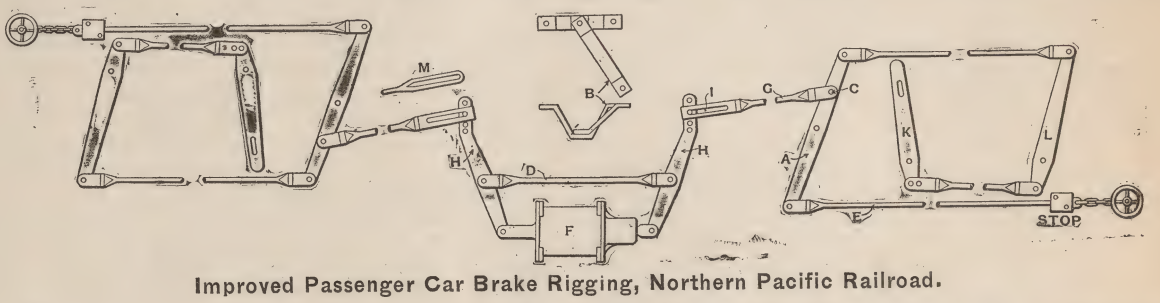
In the course of this decision Judge Morris reviews briefly the pioneer character of the inventions disclosed in patents 360,070 and 376,837 granted to George Westinghouse, Jr., and to the fact that the claims in these patents have been held valid and given a broad scope by three several decisions in the United States Circuit Court and in the United States Circuit Court of Appeals for the southern district of New York.

It was contended by the Westinghouse Air-Brake Company that claims 1, 2 and 4, of patent 360,070 were infringed by the Boyden Brake Company, but Judge Morris decides that claims 1 and 4 are not infringed in this instance on account of certain specific differences of construction, but that the broad claim of patent 360,070, which is claim No. 2, is infringed. He holds that this claim clearly states the broad scope of the invention as described in the patent, and that the claim is entitled to a construction as broad as its language will permit, and decides that the complainants are entitled to a decree for an injunction and accounting.

Improved Brake Rigging for Passenger Cars, Northern Pacific Railroad.

The inconvenience of having to bleed air-cylinders before the hand brake can be set on passenger cars when the brake is already set by air, and the danger of attempting to set the hand brake when the air brake may be applied, has led Mr. S. W. Dickinson, General Superintendent of the Northern Pacific, to have some of the passenger cars of that road equipped with the form of brake rigging shown in the illustration herewith, which practically avoids the inconvenience and danger referred to.

By this arrangement, which is patented, the air-cylinders and the hand-brake wheels can be operated simultaneously. In the accompanying drawing *A* represents a lever, which turns upon a fixed fulcrum at its center, the rod *I*, having a slotted end, is the connection between this lever and the main connection with the air-brake cylinder, and *H*, *H* and *D* are the main levers for equalizing the air-pressure to the separate trucks. *M* shows a side view of the slotted end *I* of the lever *G*. The bracket for supporting the rod *A* at its center is shown in the upper central



Improved Passenger Car Brake Rigging, Northern Pacific Railroad.

part of the illustration. By the introduction of the loose connection at *I* the hand brakes on the opposite ends of the car are disconnected, so that each brake-wheel controls only the truck on its own end. By introducing the fixed fulcrum at the center of the lever *A*, and by making the power-connection through *H* and *G* to the point *C*, the application of the air, instead of pulling on the hand-brake lever *E*, as it does in the ordinary arrangement, has no effect on *E*; thus, whenever the air is partially applied, the brakeman can produce additional pressure by the hand brakes, if desirable.

When cars have been placed upon a sidetrack the brakeman can set the hand-brakes so as to hold the brakes on after the air shall have leaked off. By the use of the slot *I* in the end of lever *G* the brakeman is enabled to apply the brakes without wasting energy on the air-cylinder or its connections.

New York & New England Improvements.

The annual report of the New York & New England Railroad for the year ending Dec. 31, 1894, has just been issued by the Vice-President and directors, and is one of the most important in the history of the company, in view of the present reorganization proceedings. It is especially interesting from the fact that during the year a system of management entirely new to that property was introduced, and the result has already vindicated the judgment of those who, a few months ago, hopefully undertook the task of placing the road upon a paying basis.

The financial statement of operations shows that, although there was a total decrease in gross earnings of $543,580, due to the general demoralization of business, there was an actual increase in net earnings of $1,984. This would be a very satisfactory showing for a road in the hands of receivers even if only the ordinary repairs and improvements had been made, but when it is understood that the sum of $308,604 was expended for improvements and extraordinary repairs and charged to the regular expense account, the result is seen to be a really remarkable one.

This encouraging condition of things was brought about mainly by a more economical and scientific system of running freight trains, by which the average number of cars per train hauled has been increased by nearly 25 per cent., with a corresponding saving in expenses. This brought about a comparative saving of 511,199 train miles, representing a money saving of over $300,000, or enough to pay for the year's extraordinary improvements.

Through this innovation the percentage of operating expenses to gross earnings was reduced from 74.06 in 1893 to 71.45 in 1894. Other permanent economies were also introduced, from which a large saving was effected without detriment to the road. The total gross earnings were $5,475,628, a decrease of $543,580, and the net earnings were $1,563,219, an increase of $1,984.

The present time finds the New York & New England road in better condition, physically and financially, than it has been in many years, with new roadbed, heavier rails, additional sidings, new rolling stock and freight sheds, the block signal installed over nearly its entire main line, and new and up-to-date methods in operation in all departments. The financial reorganization of the company, with its contemplated reduction of fixed charges and business administration, is also progressing favorably, so that, altogether, the Vice-President would appear to have ample justification for this closing expression in his report:

"In view of the possibilities of operation which have been demonstrated under the receivership, it would seem that your property possesses such inherent strength, despite any adverse conditions likely to arise, as to warrant the expectation of future results which can in no wise be measured by its past history, when once it shall be placed through the proposed reorganization on a sound financial and physical basis."

The Lenoir Foundry Works.

Lenoir City, Tenn., is one of the chief surprises awaiting the traveler in the "New South." It is situated 22 miles southwest of Knoxville, on what but a few months ago was the vast Lenoir plantation, well remembered by the hungry soldiers of both armies, and which only a year ago was covered with cotton, corn, wheat and almost everything else that can be raised in good fertile soil, now all replaced by some 200 nicely appointed and neat looking houses, where happy and contented faces are seen and where one almost loses sight of hard times. The principal reason for this great change is the erection of the new car wheel foundry and car works recently established there. The former by the well-known car wheel manufacturer of Fort Wayne, Ind., Mr. J. H. Bass, and the latter by a syndicate, of which Mr. Sandford, of the Knoxville Iron Works, is the prime mover. The Lenoir Foundry Company is certainly a great acquisition to the industries of the South, and with the well-earned reputation of Mr. Bass for making nothing but first-class car wheels, will undoubtedly prove successful. The company consists of Messrs, J. H. Bass, President; J. I. White, Secretary, and F. S. Lightfoot, Treasurer.

The works are under the direct control of Mr. W. C. Grade, a well-known and thorough foundryman, and is certainly one of the best equipped foundries to be found anywhere. The main building is 460 by 90 feet, and has a mean height of 30 feet, being well and fully ventilated. Two 50-ton cupolas are in operation, and space is left for two more when business shall demand it. At present the foundry is working 100 men and turning out 120 wheels per day and 20 tons of castings. If worked to the full capacity, the foundry is equipped for 350 wheels per day and 50 tons of castings. All the latest improvements in foundry machinery are to be found here, and no thing but the best results are expected or accepted. The works are fully equipped with patterns for general work, and under its very efficient management the Lenior Foundry Company has come to stay.

The car works adjoining the foundry are making from 7 to 10 cars per day, and one can travel many miles and stop in many much larger places, and not see the bustle and business activity here displayed under the management of Mr. R. Z. Roberts, formerly of the Southern Car Works. We predict for these gentlemen, who have by their energy and success at other points won for themselves good places in the railway world, nothing but success.

"Conservative" is the satirical name we apply to people so good that they are good for nothing.

The Vulcan Iron Works, of Cairo, Ill., were destroyed by fire late in February. Loss, $11,000; insurance, $5,000.

Tramp—"Mister, I'm a loaferin' vagabond, an' I'm not askin' you to waste any good money on me, but——"

Impatient Citizen—"Well, what is it you want?"

Tramp—"But if you've got any Canadian 10-cent pieces you can pass 'em on me, mister. I'm no street-car conductor."

The German opened his eyes and gazed with wonderment at the clock which an agent was telling him would "run eight days without winding." "You say it run eight day vidout vinding?" he inquired of the agent. "Vell, dat is ein gut clock: but if it run eight days vidout vinding, den how long vill it run ven you do vind it?

The pale-faced passenger looked out of the car windows with exceeding interest. Finally he turned to his seatmate. "You must think I never rode on the cars before," he said, "but the fact is, pardner, I jist got out of the pen this mornin', an' it does me good to look around. It is goin' to to be mighty tough, though, facin' my old-time friends. I s'pose, though, you ain't got much idea how a man feels in a case like that?" "Perhaps I have a better idea of your feelings than you think," said the other gentleman, with a sad smile, "I am just getting home from Congress."

Communications.

Advantages of Steel Trucks for Freight Cars, and Steel Bolsters for Repairs.

Editor National Car and Locomotive Builder:

There is evidence that an improvement in the construction of freight car trucks is demanded in order that the large annual expense for repairs can be reduced to a minimum. It could hardly be supposed that this expense can be entirely removed, but that it can be very greatly reduced there is no doubt. The difficulties in the way are many. Chief of them, however, as it appears to me, lies in the fact that nearly if not quite every railroad makes a complete specification for the cars for their road. There will, of course, be some of these specifications better than others. All of them, however, will be as good as might be expected under all the circumstances. Each of these individuals who have this work to do has many and varied questions to consider daily, in addition to keeping up the routine work of the office, such as correspondence, making up reports, records, and a hundred other things which engross his thoughts. Besides, he has to spend a large share of his time traveling over his road, and receiving those who call upon him on business. With all these duties and responsibilities, a specification for a car, or car truck, can receive but a small share of his time. Then, again, he may be a most excellent manager, and have great administrative ability, and may not have the same degree of excellence from a mechanical point of view. For these reasons these various designs of car trucks cannot all be of the best. There are several hundred specifications, and it would seem impossible that all would be equally good; and as so many will cling tenaciously to their particular ideas there does not appear to be any prospect of establishing a standard truck.

Then, again, we are confronted with the fact that we have in the United States about 1,200,000 cars in service. These cars are not confined in their service to the railroad owning them; they go all over the United States. A car, or a train of cars, belonging to the Boston & Maine may be loaded to go to St. Paul or to Galveston. If the car be different in its construction from others in that section, and repairs are necessary, what an endless delay and expense is incurred! There are two propositions confronting us when we attempt to better this situation. First, Would it not be likely that those who would give their whole time, capital and ability to the development and manufacture of a car truck frame, could produce a more durable structure than the railroads could under the present system? Second, Should not the design of the truck be such as could be easily repaired; or, in other words, should it not conform as near as possible consistently with good construction to those now in use, so that parts would be interchangeable?

For my own part, I am inclined to the belief that private enterprise, entirely devoted to the development and production of a car truck, would obtain better results than can be hoped for under the present system. I also am most decidedly of the opinion that the truck should be easily repaired, and should be of such a construction as to admit of the use of those parts of the present diamond truck as are standard, or are commonly carried in stock for repairs by all railroads, such as journal boxes, bolster springs, etc.

The experience of all who have to do with rolling stock is that a very large share of the expense for repairs comes from wear. The truck under the present practice is built in a manner that causes all the parts of the frame to commence to wear immediately upon its going into service. I mean by this that what is known as the rigid diamond truck is not rigid. The arch bars have holes, either punched or drilled in them, large enough to admit the column bolts to pass freely through them. The columns between the arch bars have holes bored through them with abundance of clearance for the bolts. The wings of the columns are usually bolted to the channel or wooden sand plank, as the case may be, which tie the two sides together. In every case there must be abundance of clearance to let the bolts pass freely through all these parts, as no fitting is done. This is the common practice. The result is inevitable that, immediately upon the truck being put into service, a movement to a greater or less degree occurs in every one of these parts which are bolted together in this manner. This movement creates wear, which in turn enlarges the holes, and decreases the size of the bolts, and disintegration and deterioration ensues. The bolsters, usually composed of wood and truss rods, or plates sandwiched in between the timbers, are affected in the same manner as are the arch bars, columns and bolts, only in a greater degree, occasioned by the shrinkage of the wood and consequent loosening of the bolts. All must admit this defect in the present construction, and, even if these parts are designed originally with sufficient strength for the loads they have to carry, in a comparatively short time they are in need of repairs.

Accepting these statements as facts, the next question is, How can this condition be remedied without departing entirely from the present standards? I believe it can be remedied, and without any material increase in cost over that of the present practice. Instead of using column bolts in the arch bars, they should be solidly put together with large rivets, and plenty of them, riveted hot by machine riveting. The arch bars may be very much improved by making them in the shape of channels, of about half the thickness of the present arch bar. By this means the compression member of the diamond truss will have its strength very greatly increased without increasing the metal. The rivet holes being put in line will not cut away the arch bars as do the very large holes for the column bolts under the present practice. The holes will be smaller, say ⅞ inches and drilled through metal half the thickness as used at present, will only take out about half as much metal as is taken out of the thick arch bars as at present used. This is an item of considerable economy in the contsruction. We would, by this means, have a solid structure with no loose parts to commence working and wearing. Then the side frames should be rigidly riveted to the channel connecting the two sides of the truck together. These, with a steel bolster having no bolts in it to get loose, would make a strong substantial construction, and would not depart from the present standard as regards to journal boxes, bolster springs, etc.

A truck of this description could probably be built at a cost very little in excess of the ordinary diamond truck as used to-day. I have seen a truck built substantially as here outlined, and it is stated that it can be built for nearly the same cost as the present construction. The saving in weight alone would probably average close to 2,000 pounds per car, which of itself would be a very important factor in reducing the expense of transportation, aside from the large saving in repairs. I believe, also, that in order to produce these results a metal truck of this character should be built by a manufacturer specially fitted up with machinery and facilities for doing the work in the best manner, otherwise the best results cannot be obtained.

When we consider that at least 90 per cent. of the freight car trucks in this country are of the "Diamond" type, it is conclusive evidence that they possess good points, and improvements to be made should keep as close to these lines as possible. Not only for the reason stated above, but because there are over 1,000,000 cars equipped with standard parts which should interchange with an improved metal truck, and for the further reasons that the first cost would be much less, and also because the repairs from wrecks could be made by the railroad company instead of having to put them in the scrap, as would likely be the case were the design such that it could not readily be repaired.

The saving of 2,000 pounds per car in weight on tho cars now in service would mean a reduction of more than 1,000,000 tons hauled daily on our railroads. Of course, this can not be accomplished because the trucks cannot all be rebuilt. A vast saving in this direction, however, can be accomplished by adopting a good steel bolster for replacements of wooden and composite bolsters in repairs both for the body and truck. And by using steel body bolsters and steel trucks of a type for new cars in the future, the parts of which will interchange with the present standards.

Consider for a moment what the saving would be were the railroads to now commence to replace body and truck bolsters for repairs with a steel structure, and to use them for new cars. Under normal conditions something like 100,000 cars per annum are built. At 2,000 lbs. per car, this would mean a saving in dead weight of about 100,000 tons per annum. By using steel bolsters for repairs to cars now in service, this saving in dead weight would be nearly doubled The cost of hauling this enormous weight runs into millions of dollars annually.

The necessity for reducing expense of all kinds in operating railroads is imperative. Few are able to earn dividends, and many have difficulty in meeting fixed charges. I know of no more fruitful field for the exercise of economy in car equipment than this.

M. C. B.

Stationary Boiler Practice and Shop Heating.*

BY C. M. HIGGINSON.

By request of the secretary I wish to offer, not a connected paper, but certain rambling notes upon which a discussion of the subject of stationary boiler practice and shop heating can be commenced. It is to be remembered also that the fuel we are considering is Western soft coal. Perhaps the best way of starting this would be to call attention to some of the defects which we may note at various places, not only in railroad, but in other work.

It is safe to say that three-fourths of all the steam plants within sight of the room we meet in have one or more of the defects hereinafter referred to. We see steam plants where the chimney is entirely too small for the number and size of boilers that it is expected to serve; the consequence is, a poor draught and poor combustion. We see the breechings and connections between the boilers and the chimney too small for the current of gases that must pass through them, and we find the up-take pipes from different boilers placed so that the currents toward the stack conflict with each other, all of which troubles again spoil the draught in one or more boilers in the plant. We find the grates sometimes too large and sometimes too small for the boiler they are set to. We find some grates, instead of having about 50 per cent. air opening, to run sometimes as low as 15 to 25 per cent., thus preventing a free access of air to the fixed carbon of the fuel. We may find the boilers set within ten to fourteen inches of the grate, cooling the newly evolved gases and preventing their combustion. In some cases we find no provision for admitting air over the fire, which the best practice demands. We find further, no means for an intimate mixture of the coal gases and the air so admitted; in fact, unless such means for admixture are presented, it is not best to attempt to admit a great quantity of air above the fire, as the air and gases go over the bridge wall in separate layers without igniting, and the air finding its way against the boiler cools it to a certain extent. We also find boilers so short that there is not sufficient flame-way to finish the combustion of the burning gases, and, in all events, not to give sufficient travel to allow the heat evolved from the combustion of the coal to be taken up by the water in the boiler, the consequent result being a very high stack temperature and waste of fuel. We also find that the gases are allowed to go from the tubes direct into the stacks, when, by being passed over the top of the boiler again under the brickwork, an additional amount of heat might be absorbed by the water and steam, more work got from the coal and the stack temperature lowered. It will be noticed that, in the main, these are matters, not of theory, but of every-day mechanical practice, yet upon the slighting of them much loss of fuel, which is property, rests.

When we come to consider the matter of heating shops by steam, we find all manner of crude appliances, mainly due to the gradual additions to buildings and plant. Live steam is used from the boiler at a high pressure, through all kinds of illy contrived coils and pipes, the result being much leakage, an occasional bursting of pipes or radiators and great waste of fuel and unsatisfactory results generally. There are a number of excellent methods of using exhaust and low pressure steam when plants are put in new, and it will not be necessary to dwell upon them here. The great want that I have discovered in our railway buildings is that of simple adaptations of practice of using exhaust steam to existing plants. When the matter of improvement is suggested, an appropriation may be asked for to put in some quite expensive combination, which, though excellent in itself, is out of the question in these times of enforced economy, and it would seem as if some of our best mechanics were sometimes rather too unmindful of the value of what might be called approximate methods. When you connot get a whole loaf, you should be content with half a one, and, if you cannot put in what is considered a desirable steam plant for heating by exhaust steam, it is better even to use the steam from some one engine, that in a corner of the shop is now exhausting into the open air, for heating the portion of the shop immediately by it. We can in many cases cheaply arrange a return system for use at least on a part of our plant, without the expense of exhaust pumps or other complicated devices.

This whole matter of shop heating, and especially the reorganization of existing plants, is a very fertile one, and one in which much saving in fuel and in the amount of boiler plant needed can be made by studying the detailed conditions of each building and each plant separately. To show how local conditions may change a carefully designed plant, I might state that in our general office building the plan presented by the architects for the heating system showed a beautifnl series of arrows indicating the direction of cool and warm air due to the arrangement of radiators and ventilators. In practical working, however, we found by an exhaustive series of experiments made with that elaborate apparatus called a tobacco pipe, that the course of the currents was in directly the opposite direction, and it was not until the radiators had been moved to the opposite side of each room that satisfactory and economical results in heating were reached.

In matters of boiler practice and shop heating, as in nearly everything else on a railway, close attention to details and the persistent improvement and betterment of little individual things is of more vital importance than the discovery of some great system which will revolutionize present practice. This revolution of practice will come in due time, if it is on the books, but before it comes we can save thousands of dollars by close watch and readjustment of matters which are under our eyes every day.

Discussion.

Mr. Barr (C. M. & St. P.): Mr. Higginson's remarks hit me. I am sorry to say that I do not believe that we have a heating system on our road that is what might be called economical. We have been trying to economize, and in order to do that we have been looking at the details of expenditure. I took for one item the amount of coal consumed at the West Milwaukee shops. We have quite a large plant there, and I found that in the month of January our bill for heating and running the shops was something over $4,000, running up possibly to $35,000 a year. with one of the most important of the heating plants largely supplied with waste wood from the car shops. Now, we certainly are spending $10,000 or $15,000 too much there. I started in, in the first place, and said they were keeping the shops too hot. No, they were not keeping the shops too hot, just keeping them about right for men to work (although most of the men had to work in their shirt sleeves). I then said I supposed they kept this plant just as hot in the night as they did in the daytime. No, they did not; there was nobody there to keep it hot at night. I inquired of one of the men, "How is this in the morning when you come in here? Are you warm and comfortable to go to work?" "Oh, yes; it is a little hotter in the morning than it is any other part of the day." The doors were not open so much, the steam was going ahead, it was getting in its work all right, and the doors not being open so much, left the shops hotter in the morning when the men came in than during the day. Now, without changing the steampipe, as Mr. Higginson suggests, and without putting in an elaborate system of exhaust heating, I think we can effect considerable economy there by not keeping those steampipes quite so hot at night, and I am in hopes to show something in that line. At the same time, it is very much as Mr. Higginson says; we are going to heat a shop, we figure out the amount of radiating surface we want, we put it in generally under the workmau's benches, with boxes in front of it, and so on, so that we do not get too hot, and we start it off. Then we have got another shop that I think we ought to heat, and we lead a pipe to it, and get over there somehow so as to take the least number of feet of pipe possible, and undertake to heat that shop. I have no doubt but that as a result we burn twice as much fuel in the winter time as we ought to. I feel somewhat crestfallen to stand up before you and say that, but I do not believe I am alone in it, and I do not know that there is anybody here much better off than I am. That is the fact in our case, and I know it is the fact in a great many other cases, and we learned it simply by looking at what we were spending in this one item of heating fuel. In this same connection I would say that our General Manager brought up the question of water; he said, "We are paying a good bit of money for water at West Milwaukee." I said, "I never see the bills; I don't know what we are paying." But I hunted them up; we are paying about $20,000 a year for water from the City of Milwaukee. It is good water for engines; but we have got a six-inch artesian well there, with about 60 pounds pressure, and a good bit of that is running to waste. That water is not fit to put in boilers, but I have an idea that with a very little expenditure we can use it for washing out and general purposes. It may take a new line of pipe, but still that new line of pipe will be paid for within six months if we can reduce the consumption of city water, as I think we can.

President Gibbs: I might say, for the benefit of members, that we have been selling front end cinders to a manufac-

* Read to the February meeting of the Western Railway Club.

turing plant in Milwaukee, and they have been burning them in an automatic stoking furnace, using about 75 per cent. of cinders to 25 per cent. of coal. I have not seen the evaporation results from it, but they tell me that they burn very little more weight than they did before. If they can do that with economy, perhaps we can. Of course that means a large grate surface and some alterations in the boiler, but it is worth looking into.

Mr. Barr: I think almost any railroad makes enough front end cinders to heat all its shops, if it could so utilize them.

President Depew's Novel Rides.

President Chauncey M. Depew, of the New York Central Railroad, has been varying the monotony of private car riding by taking exhilarating trips in other conveyances. Recently he visited the country place of Dr. Seward Webb, President of the Wagner Palace Car Company, near Burlington, Vt. The usual sports in that locality are snowballing, sleigh riding and toboganing. The natives tried to seduce their genial visitor into participating in these sports, but he fought shy of them all until recollections of his boyhood days coaxed him to become one of a coasting party.

Mr. Depew, in speaking of the experience to a newspaper man, said:

"Now, you understand the difference between coasting and tobogganing. On a toboggan there is only one passenger, and he can steer himself. A nice course is built for him and everything is smooth and lovely. But you take a bobsled, such as I went coasting on, and it is quite different. There were about 30 passengers. There was no beaten track, and the bumping and danger added zest to the sport. When I think of what might have happened if we had hit a tree, why"— Here Mr. Depew made a gesture that was adequate to show what he meant. "There was one man," he said, "who steered, and all our lives were in his hands. We went over to the hill and started off. It was a long ride, and when we were fairly started and had acquired a real momentum, do you know we got to going at the rate of"— Here Mr. Depew scrutinized his listener closely, as if to probe his ability for comprehending great truths, and then said slowly and with emphasis: "We attained the speed of about one mile a second. It was a new experience for me. I have had sled rides when a boy, but this flight down a snow-clad mountain was quite different. There was a grandeur and exhilaration about it that were buoyant and bracing. Every one seemed to hold his or her breath, and we tore down the hillside. It flushed the cheek and brightened the eye; it exalted the feelings, *but it was a long way back!*"

After returning home, and in speaking of his trip to Vermont, Mr. Depew said:

"That ride on the bobsled was unusual, but I can tell you something that beats that. You see, when I decided to go up to Burlington to visit Dr. Webb, a party was made up, and I had my special car attached to the train. I almost forgot that I was to go, and remained at my office until about 6 o'clock. The train left at 6.25. When I recalled the fact I hurried home, dressed in great haste, and packed a few things in my bundles. These I turned over to my butler, and I hurried down to the front door and looked for my cab.

"I had ordered a carriage to be at the door at 6.10. Here it was 6.15, and not a sign of it. I called to my butler to follow me, and ran to the corner to look for some sort of a conveyance. I reasoned that a good horse and a stout carriage would land me at the station with one minute to spare. I looked all around, but there was not a cab in sight. Backed up against the curb was a delivery wagon for a drygoods company. The horse looked like a good one. I hurried up to the driver and said: 'I am Chauncey Depew. It is necessary that I reach the Grand Central Station inside of ten minutes to catch a train. Can you take me?'

"His answer was laconic, but forcible, and I drew from what he said that he would make it or break something. That settled it. The driver threw the parcels back in the wagon, which he had been taking out. I climbed up beside him. My butler threw my bags in behind, and with a cut of the whip we were off. John Gilpin's ride was outdone. We dashed down Fifth avenue like a hurricane. At different places policemen ran out and tried to stop us. I waved them back, and when they saw me they rubbed their eyes in amazement, and, I suppose, wondered whether I had gone mad or whether the New York Central Station had blown up. We got to the depot with a minute to spare. I found my party somewhat worried, and they viewed my strange appearance in open-eyed wonder."

In Chili, according to *El Ferrocarril*, of Santiago, two new railroad lines are about to be constructed. One line, for the building of which 21 mercantile firms are asking concessions from the Government, will unite Patillos with the nitrate fields of Tarapaca. A concession has already been granted for the other line, which will connect the districts of Quilpue and Melipilla with the central railroad between Santiago and Valparaiso.

Two boa constrictors were recently confined in the same cage at the London "Zoo." They differed but slightly in size. On the return of the keeper from a few minutes' absence the smaller snake had apparently stepped out for a morning's constitutional, the only occupant of the case being Boa Major, quietly slumbering with, as was subsequently discovered, the other fellow inside. The only sign of the trouble was the increased bulk of the victorious animal. He showed no signs of remorse nor apparently of indigestion. He became very sleepy, and the only result, according to the keeper, will be that he will not require to be fed for the next six months.

A Locomotive Boiler with Welded Seams.

The Lehigh Valley Railroad has in service a locomotive (No. 444) the seams of the shell of which are riveted, but the corrugated furnaces and the single combustion chamber have welded seams. The engine was put in service November, 1886, and was placed in the shop October, 1887, to have the fireboxes taken out, on account of their constant leaking. New fireboxes, with welded seams, were put in July, 1888, since which time they have proved serviceable and satisfactory. The corrugated furnaces in this boiler are longer than it was possible to get the metal from the mills, and therefore both furnaces have a circumferential weld to make them the proper length. The connections between the two corrugated furnaces and the single combustion chamber are also welded. The furnaces and combustion chamber originally used in this boiler were furnished by the Leeds Forge Company, of England, and the boiler built by the Edge Moor Iron Works, of Pennsylvania. These original furnaces were riveted circumferentially in order to make them the proper length, and gave a great deal of trouble by leaking. They were removed, and the Continental Iron Works replaced the furnaces, as described above. Mr. Samuel Higgins, Superintendent of Motive Power of the road, informs us that, as before stated, the seams have given absolutely no trouble whatever since they were welded. The engine carries a steam pressure of 185 pounds.

In this connection a paper read by Mr. Warren E. Hill, Vice-President of the Continental Iron Works, on "Welded Seams in Plates," before the division of marine and naval engineering at the World's Engineering Congress, is of special interest, and we therefore republish herewith a brief abstract of the paper:

The Continental Iron Works first employed welded plates practically in the construction of the boiler furnaces of the United States ironclad monitor "Monadnock," in 1876. These furnaces were 36 inches diameter, and 8 feet 7 inches long and ½ inch thick, each furnace consisting of three cylinders, flanged at their ends, and joined together on the Adamson principle. These furnaces successfully stood the test then made under the supervision of United States engineer officers stationed at the Continental Iron Works; a section of the furnaces inclosed by a jacket being subjected to a collapsing hydrostatic pressure of 450 pounds to the square inch. The weld proved to be perfect, and it is to be regretted that the test was not carried to the point of collapse or destruction, in order that further data of value might have been obtained.

A demand then arose for reservoirs in which to store carbonic acid gas under great pressure. These reservoirs were for use in the "Lay" torpedoes, many of which were built for the Russian and other European governments, several being turned out in the year 1878. These vessels were of plate iron, ½ inch thick and cylindrical in form, being 54 inches in length in the cylindrical part, 24 inches inside diameter, and having heads ⅝ inch thick, which were dished 4 inches. The seam along the body and the circumferential seams forming the junction between the body and the heads were made with a glut piece. The heads were of extra thicknes, since they had to serve as an anvil while the gluts were welded in the corners. These vessels were subjected to hydrostatic test pressure of 1,800 pounds to the square inch. A steel tape line encircling the cylinder during the test measured the circumferential enlargement, which reached 1¼ inches; and, though the test strain exceeded the elastic limit of the iron, and the stretch remained permanent, yet under this great pressure the welds continued perfect and no weeping at the seams was detected. Carbonic acid gas was to be stored in these reservoirs at a pressure of 800 to 1,000 pounds to the square inch, and was to be supplied to the propelling engines at a greatly reduced pressure by means of reducing valves.

When steel came into general use, and to a great extent displaced iron because of its greater tensile strength and ductility, it was still the practice in welding the steel to employ a V-piece or glut of iron; in fact, it was then considered impossible to otherwise produce a proper weld. In 1885 a water or hydrogen gas plant was erected and the use of this gas fuel was a great stride in the advancement and improvement of the art of plate-welding. Heats by this gas were quickly obtained, were uniform, and there was an absence of ashes, clinker and dirt. More particularly was the advantage of heating jets which could be applied simultaneously on both sides of the plate by the use of two portable furnaces, gas and air being conveyed to their combustion chambers through flexible tubes in volumes of 2⅛ of air to 1 of gas. The furnaces are supported so that they can be readily thrown in or out of action, and their gas connections are fitted with proper valves convenient to the welder or furnaceman, who readily controls the mixing of the gases so as to produce the most effective heats. The cylinder or work to be welded is placed on a tracked carriage with the seam at the top, a fixed bar anvil is arranged in the upper part of the cylinder in line with the seam, and the furnaces in close proximity are located on opposite sides of the seam parts, and adjacent to the anvil; thus the time of getting the heated parts over the anvil and under the hammers is reduced to a minimum.

The practice of welding with fuel gas soon made apparent the objections to interposing a piece between plates for the purpose, as had been thought necessary, for producing a reliable weld. The essential objections to the presence of a glut in a seam are, that there are two welds or junctions instead of one (the two edges of the plate being joined to the two sides of the glut) to resist the strains of the cylinder when under pressure, and the objectionable necessity of separate fires for the plate and glut bar. The question then arose: Why not dispense with the weld piece or glut, and scarf and join the edges of the plate as a smith would scarf and join bars before joining them by a weld? And so in a short time scarf-welding became the established practice, the edges of plates to be joined being hammer-scarfed or planed to a proper bevel while the plates are flat. In Europe it is common to dispense with such scarfing, either by planing or hammer work, mainly as an economy of cost of labor; and when rolling the plain plates to cylindrical form preparatory to welding, their adjacent edges are left in the position of an overlap, which overlapping parts are, when heated and subjected to the hammers, mashed one into the other. The defects of such practice are that the corners of the plate edges that come in contact with the anvil and hammers immediately lose their heat, and thus an unsatisfactory weld results.

Such a weld made in a pipe of any considerable thickness will, upon critical examination, be found to exhibit the result of these defects, and show that the skelp was not scarfed before welding. With a scarf-weld, however, th body of the plate is not cut into, and if desired the thickne s at the weld can be in excess of that of the plate. Scarcely any one not familiar with the subject will be able to discern the practicability of making cylinders of considerable size by welding steel plates together for holding high pressures, be cause, as has been argued, no methods were known by which the integrity of welded seams could be assured, notwithstanding the fact that for a generation past almost every internally fired boiler has been provided with cylindrically constructed pipes, or tubes, having welded seams measuring in length from hundreds to thousands of feet, and no engineer questions the integrity of the welded seams of such productions. These pipes or tubes, it is true, were and are welded by machinery, but only in limited sizes, and the efforts of those who have made a constant study of and improvement in this art of welding have been simply to enlarge upon and extend this old method, which has unquestionably been accepted as a perfect but restricted method of producing such structures. For years the limit of the diameter of an iron lap-welded tube or flue was 12 inches; now the production of tubes of 24 inches diameter is a common operation. It is now the common practice to weld up boilers and other vessels of 7 or 8 feet diameter, having a length of from 30 to 33 feet, which diameter and length is only limited by the restrictions of railroad transportation, by the size of the apparatus producing the welds, and by the oven in which the vessels are annealed, for all structures of this nature have finally to be annealed in order to relieve the metal of strains produced by the welding,

In the opinion of the writer, the time is not far distant when the shells of boilers or vessels, similar to those used by our transatlantic steamers and our United States Government cruisers, will all be constructed without the use of rivets or calking. Thus the full advantages of the method may be realized, because, as can be easily proven, the welded portions of the structure are of the same value in tensile strength as any other portion of the material of which the vessel or boiler is constructed. When welded boilers come into more common use, and experience shall overcome the prejudices which to some degree obtain against them, then steam-boiler shells may be lightened in proportion to the difference which common practice now allows as against boilers having riveted joints; for aside from the weakness of riveted joints, and even with metal of the same thickness as required for riveted work, the weight of butt-straps and rivets will be dispensed with.

Some Interesting Hydraulic Jack History.

The hydraulic jack was invented in 1851 by Mr. R. Dudgeon, of New York City, and a patent was immediately secured on the invention and the manufacture of this widely and exceedingly useful tool was begun in a moderate way. A New York druggist, Dr. E. Lyon, furnished Mr. Dudgeon considerable financial assistance at the beginning of his labors in this direction. Messrs. Watson & Stillman, whose extensive works are situated at Nos. 204 to 210 East Forty-third street, New York, are the successors of Mr. Dudgeon and his associates in the manufacture of hydraulic jacks. The oldest hydraulic jack in existence, the first one made by Mr. Dudgeon, is now to be seen at these works, and it is an interesting relic of the early types of this tool. Compared with the present highly improved hydraulic jacks, manufactured at these works, the progress in the methods of manufac ture and the numerous improvements made in these tools are very evident. Notable among these is the arrangements to repack and also to tighten without having to repack, the packing in the head; the facilities afforded to get at the pump packing and the pump valve without having to remove the ram from the head, and the reliability of the lowering mechanism with its very important feature of dislodging foreign matter which may become located at the valve seat. All jacks below 60 tons capacity made at these works have rams forged from the solid steel.

While reference is made in the foregoing, especially to hydraulic jacks, Messrs. Watson & Stillman make a specialty of the manufacture of all kinds of hydraulic machinery, tools and supplies. Among their latest pieces of interesting work was a 150-ton hydraulic press for the Westinghouse Machine Company, and a 15-ton jack for South America.

It is estimated that the oceans and seas of our globe hold not less than 60,000,000,000,000,000 tons of salt in suspension. If these figures are correct, and the oceans should be entirely dried up, there would be a deposit of salt 450 feet deep over every foot of the great basin. If taken out and spread upon what is now dry land, it would give us a salt covering nearly 1,500 feet thick.

Including stocks and bonds, the railways of the United States are capitalized at $60,000 per mile, while those of Great Britain are capitalized at $220,000 per mile, or nearly 400 per cent. higher than in this country. The total stock and bonds issued by the railways of the United States is $10,650,325,514. At $220,000 per mile it would be $38,500,000,000. British railways earned more than $20,000 per mile in 1893, while American railways earned only $6,300 per mile.

"What Are the Best Means of Saving Coal?"

The following is an abstract of a report on this subject, and the discussion of it at the last Traveling Engineers' Convention, the proceedings of which have just been published. The report contained a number of questions, to which replies have been given by about 36 roads. In discussing the report it was taken up in the order of these questions. We republish herewith the leading questions and the most pertinent remarks in reference to them :

Q. Are your freight trains ready to leave on time ordered?

Twenty-two answered no; 14 answered yes.

Mr. Scott (A. T. & S. F.): Our freight trains are ordered the same as our passenger trains and the engines handled in the same manner. The transportation department furnishes the order saying engines will be wanted for a certain train at a certain point. Any discrepancy between the time ordered and the actual departing time of the train is shown on the engineer's report. If there is any delay attributed to the engine, it is taken up in the mechanical department; and if there is any on the other side of the house, it is taken up in the same way, and nearly all our freight trains go out as promptly as the passenger trains. That has been done in the last three or four years.

Mr. Slayton (C. G, W.): Mr. Scott has just about explained the situation on our line, except any delay of that kind to exceed an hour, the engineer and crew are paid for, which helps to check delays.

President Conger (C. & W. M.): Costs money besides coal?

Secretary Thompson (L. S. & M. S.): By both departments working together they can get along together under any ordinary circumstances by not having an engine stand in the yard more than 20 minutes for any train; then there is no coal wasted, no money paid for overtime, or anything else, and at the end of the year you would find a great saving.

Q. While on the road do your firemen exercise the necessary care in firing the engine to avoid blowing off steam?

Thirty-one answered yes. Five report that firemen disobey instructions, expecting their seniority will enable them to hold their jobs.

Mr. Scott: I think it unjust and unfair to blame the firemen for all of this. The engineer is just as much a factor in coal saving as the fireman, and it depends on him and his manner of handling his engine whether the coal will be saved or not. I believe that every boat should have but one captain, and in this case the captain is the engineer, and he is responsible for the action of the fireman. He is supposed to be the more intelligent of the two, as he has the most experience. Of course it is all right to give the fireman some instructions, but the instructions should come from the engineer. He should be told, and if he does not instruct the fireman in the performance of his duties, as he should, the traveling engineer can call the engineer's attention to it, and it would also be in order for him to talk to the fireman, but I don't believe it is fair to tackle the fireman and blow him up very extensively. Mr. Mast stated that they ran their engines over divisions of a hundred miles and did not have to shut the injector off. If there is anything that will waste fuel, if you make any stops, that will do it. If you shut off the engine the water s going into the boiler all the time, the fire has not been iburning the same as when the engine is working, and consequently when the throttle is opened the boiler is robbed of all the steam there is, and unless you shut the injector off you will lower the temperature in the firebox and consume lots of coal. If the fireman is firing for an engineer that runs that way, he has got to put in fire; can't do anything else; but if the engine is handled intelligently by the engineer, showing his orders where he is to meet trains, making sure that the fireman understands the orders he has read; if he takes an interest in the work, knows the places where the engineer is going to shut off, and the engineer helps him all he can, it will make a great difference; but I believe it should be done through the engineer; he is the man in charge of the engine and should give instructions to the fireman.

President Conger: I do not consider it a good practice to require the fireman to fire against the throttle and a green fire and the injector all at the same time, while pulling out of the station. You cannot help the throttle; they have got to open that to get started. We can have a little fire beforehand on some of the hard steaming engines, but the injector we can manage right straight along.

Q. In your experience do you find the brick arch a medium for saving coal?

Thirty-two report the brick arch a medium for saving coal. One reports no, because firemen throw coal over the top of the arch. One reports no, not unless flues and arch are kept clean. Your committee is somewhat inclined to think that the last two answers to questions are commendable to the convention for a few practical hints on stopped flues, and poor firing of engines, especially those equipped with brick arches."

Mr. R. D. Davis (I. C.): We have the deep firebox that we have run with and without brick arches. There is no difference in the mileage practically, but we find that we can get along with a great deal less smoke with the brick arch than without it. We have 25 Brooks' passenger engines. We have tried brick arches on these—by the way, the boiler is on the top of the frame. The mileage sheet does not show that we make any improvement with the brick arch over engines without them. Recently the order was given not to purchase any more firebrick for those engines. We ran them in different sections of the country, the same classes of engines being run that are being run now without the brick arch. At the same time we try to use brick arches in suburban service in Chicago as a preventative of smoke. That is the great question at the present time.

Mr. Turner (N. Y., L. E. & W.): I believe they are a good thing as a rule.

Mr. Scott: I would like to ask the gentleman if he makes any changes in the diaphragm at the front end when the brick arch is removed or put in.

Mr. Davis: As a rule, we have not.

Mr. Scott: I think that makes quite a difference. I have found that where you use a brick arch you should have a great deal more opening than without, and it seems to me that there is a saving effected and the black smoke done away with by the use of the brick arch. I also find that the flues do not stop up so readily, and in places where we have reasonably good water we have no trouble with leaky flues, not nearly so much as we do with the brick arch.

Mr. Meehan (D., S. S. & A.): When our company sends out an engine without a brick arch there is a kick from the engineer and fireman; they are in favor of saving coal. We do not have much trouble with flues; only clean them once a year.

Mr. Mast (Chic. & Erie): A brick arch may not be adjusted properly; you may have it too close to the flue sheets; you may have it too short; it may not be high enough. We are running our engines without them. It is a saving of fuel to have them.

Mr Stack: (Union Pacific.) On our road we use the brick arch. We use it on all divisions except one. Where the water is bad we cannot use the brick arch. We cannot use the water tube without the brick arch. The water tubes will pull out, the water is so bad. But we run a large number of engines with the brick arch, and get better mileage for the coal out of them. Where we take out the brick arch and do not put them in, we usually have to reduce the exhaust nozzle about 1/8 to 1/4 of an inch. All our engines have Diamond stacks. On our 18-inch cylinders we run 3¼ to 3½ double nozzle. That is, it depends on the coal. We are using two different kinds of coal on our main line. With Rock Spring we use a 3½-inch nozzle, and with Carbon coal, that is, Wyoming coal, we can run 3¼. Rock Spring is a free burning coal, and a better steaming coal than the Carbon. The Carbon fills up so we have to reduce the nozzle on that account. On this bad water district Mr. McConnell has equipped a part of the engines with a feed-water heater. They have no ar hes. Since putting those on we have opened the nozzles from 1/4 to 1/2 inch on each engine that we put this heater on, without a brick arch.

Q. Have you tried the plan of paying premiums to engine crew showing the most economy in coal?

Twenty-nine answered no. Six answered yes.

Mr. Slayton: I would suggest, Mr. President, that the only premium offered firemen on the consumption of coal is that his merit shall be considered in the line of promotion. I think that should be premium enough.

Q. What is your opinion of the premium system?

Sixteen reports do not approve of it. Ten report favorably, saying it is the proper system. Four report working that system with good results. Six report saying the premium system makes firemen dishonest.

Mr. Chapman (F. E. & M. V.): I do not believe in paying a fireman a premium. You are paying him every day, and you are paying him a good round sum for his work. He cannot go into any other kind of business if he is thrown out of employment and get any better wages than he is getting now. Why pay him that and then pay a premium besides? I think he would be trying to steal coal from the other fellows.

Mr. Kidder (W. A. B. Co.): I have thought a good deal on that subject, while I never had any direct interest in it, because it was never used on the road where I was employed, but I am opposed to it and always was, from the fact that I believe that it is liable to lead certain men in a dishonest direction, and another thing it may be that you can take two engines of the same class, and the fireman that is using the greatest effort from an economical standpoint is the one that is making the poorest showing, and the man that does not get the reward, because there are certain other elements come into the problem.

Q. Does your company employ a traveling fireman?

Twenty-eight report no traveling fireman. Five report that they employ traveling firemen.

Mr. N. S. Moore (C. & N. W. R'y): I will say that on the Wisconsin Division of the Northwestern I have a traveling fireman under me, but his duties are to look after the smoke in the city, and to instruct the firemen to do away with all the smoke they can on account of the city ordinance there being very strict.

Secretary Thompson: The Lake Shore has employed a traveling fireman for the past ten years, and finds that a good bright fireman in that capacity is a paying investment. He is a good man to have around all the time, and he is a wonderful help to a traveling engineer.

Q. If you do not pay premiums, what course do you pursue to encourage engineers and firemen to save coal?

Ten report, by posting performance sheet in round-house for engineers and firemen. Five report, we expect engineers and firemen to work with a spirit of emulation.

Your committee is of the opinion the engineer is not sufficiently drawn into this question. It is apparent to the committee that the engineer should assist the fireman in saving fuel. A good fireman may show a poor record with a poor engineer. The engineer may be in the habit of pumping his engine with his injector working at full range, where the injector will supply the boiler at fine range. Such engineers will come into the round-house and report to the engine dispatcher that he "don't think that fellow can keep her hot." Other engineers may not keep their piston packing and valves in first-class condition, allowing valves and piston to blow several days before reporting. You are all aware valve and piston packing blowing will make an extra large hole in the coal pile. Other engineers may be in the habit of working 16 inches of steam after the train is in motion where 12 inches of steam would do better. Passenger engineers can assist much by working their engine at high expansion as soon as possible after the train is started.

Q. What number of miles do you consider it practical for an engine to run before overhauling as regards fuel consumption?

Mr. Kidder: I believe that the usual practice, to a great extent, in this country, is one that is costing companies more for coal than perhaps any other thing, with the exception of radically poor firing. We occasionally pick up a publication and read of an engine making a great many thousand miles without any work being done on it. In my own experience, running an engine, I used to run my engine until the flues were pretty bad, and for several months there was a constant struggle to get steam enough. Now, I believe there is a question that will stand a little talking about here, because I believe that a very general practice is that the engines run and get a mileage rate, while, if they were taken into the shop every few months and the old flues taken out, it would make quite a difference in the amount of fuel consumed.

Mr. Slayton: My experience has been that there is no money in keeping an engine in service after the boiler has filled up with scale and mud so it is a difficult matter to keep it from leaking. The cheapest way is to take the engine in and clean out the boiler and get a new set of flues. Delays to other trains, when you are running many trains, is an item alone that will make it cheaper to do it.

Q. What front end do you use, extension or short?

Thirty-two report use extension front with good results, have no trouble on the road, have less fire claims, hold up steam to the last mile. Two report best results with short 18-inch extension."

Mr. Scott: I think that is largely a matter of opinion, and it would just simply lead to a long-winded debate about which was the best front end. It is like a man and his wife. If he is suited with her, it is all right.

Q. Have you any engines built with firebox on top of frame? If so, what results do you notice as compared with standard box?

Eighteen report have engines with firebox on top of frame, burn less coal, steam better, have more heating surface.

Q. Do you consider black smoke imperfect combustion? Are your engines fired with a view to alleviate it?

Thirty-two report black smoke is imperfect combustion, and engines are fired to alleviate it as much as possible.

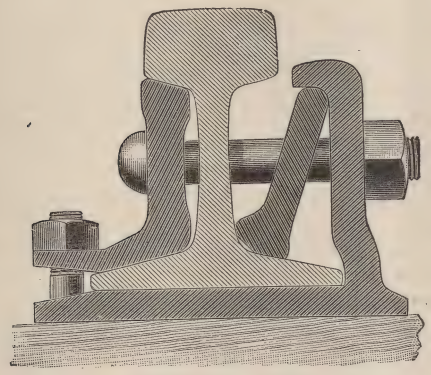
Your committee finds in answer to question 40 that black smoke is evidence of imperfect combustion. But with some kinds of coal it cannot be avoided without great expense for special devices. Yet while the fireman is expected to fire light, and keep a clean fire to alleviate the black smoke as much as possible, he needs both assistance and instruction. We will offer a few practical hints to the fireman, which will help him in alleviating the black smoke. It is the lack of oxygen entering the furnace in sufficient quantities to combine with the black smoke, which is carbonic gas distilled from the heated coal, that lacks the oxygen to unite with it to bring about combustion, consequently the gas passes through the flues without being ignited. Instruct the firemen to slightly open the furnace door, to admit sufficient air to ignite the gas, and thus burn the black smoke. Firemen will say, "Well, if we have good results by opening the furnace door a few inches, why not open it wide and get better results? Do not open the door wide. You will admit too much air in the furnace, which will chill the carbonic gas so that it will not unite with the oxygen and pass through the flues without the carbon becoming consumed. A good brick arch, when properly cared for, is a very valuable aid to economical combustion. The great mass of hot bricks helps to maintain the temperature of the firebox even, and is often the means of raising gases to the igniting temperature before they pass into the flues. Projected as it is into the middle of the firebox, it lengthens the journey of part of the fire gases and acts as a mixer of the elements that must combine to effect combustion.

Tim and the Dog.

A whining and scratching at the door of the section house interrupted the conversation, and the boss said, "Somebody let the pup in." Dutchey opened the door, and a blazed faced, glass-eyed, long-legged, hairy dog came bounding in and jumped on Tim with his snowy feet. "Git out you confounded fool," said Tim, as he slapped him over. "Tim and Hobo has had a fall out," said Big Mike, and he called the pup over and patted him on the head, and said, "You are a smart dog, ain't you, Hobo?" "He's the biggest fool I iver see," said Tim, "he hain't got as much sinse as a blind goslin." "What makes you think so?" asked the boss, as he laid the paper down and rolled over in his bunk. "Well," said Tim, "whin I first took him out wid me last week I thought he wud be company to me, an' moight give me warnin' of any wild bastes that moight be along the track. So I let him go wid me, and everything wint along all right 'til this afternoon. I found a big flat rock layin' on the track near this ind of the canon an as it was too big for me to handle I just got out me shtick of giant, fixed the cap and fuse all right, thin looked around for another rock to lay on top of the powder, but couldn't find any as iverything was covered with snow; so I jist lay the shtick of giant powder right in the middle of the top of the rock an while I was tryin' to light the fuse I seed that infernal pup shtandin on the other side of the rock waggin his tail an watchin me and the shtick of giant. Well, at last I got the piece of fuse lit an hollerin "here, here, Hobo," I shtarted down the track on a run and the dog at me heels an after going four or five rail lengths I looked back to see if the fuse was burnin, but there was nothin on the rock; I was thinkin the shtick had rolled off whin the dog jumped up with his two feet on me vest, an I hope to be shot if the blazed faced idiot didn't have the shtick of giant in his mouth an the fuse a fizzlin' for all that was out. Well, sor, I was nearly skeered to death; I whirled round and heeled it down the track as tight as I could go, yellin at the pup ivery jump to drop it, but he held on to it an staid right wid me; then I was sure I was going to be kilt and not wantin' the train to run over the pieces I turned out of the track, but the snow was nearly up to me waist an I floundered for a little while and then fell and the dog jumped on top of me; I could feel me heart beatin terribly an expectin every second to be blowed into smithereens; I tried to think of a prayer and was about to make it when the dog turned around an began to switch snow down me neck wid his tail; that made me mad an I turned over intending to hit him a belt on the head whin I noticed the fuse was gone out of the shtick of giant; thin I was so wake I could hardly move, but purty soon I got up and kicked the mortar out of that confounded fool dog an sent him home a flyin; I found the burnt fuse close to the track in the deep snow where he had shtepped on it and pulled it out; then I went back an put another fuse in the shtick of giant an broke the rock widout any more trouble."—Jerry Sullivan, in *Roadmaster and Foreman.*

The Niles Rail Joint.

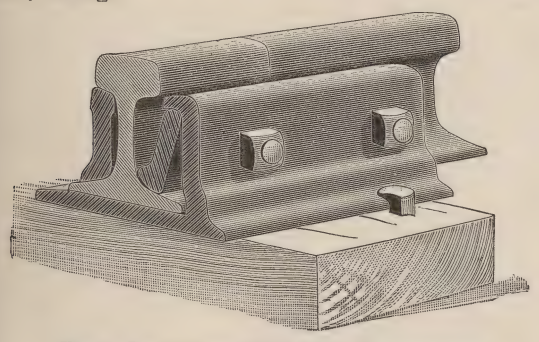
It is generally conceded that to meet the demand for cheap transportation with heavy rolling stock and an ever-increasing speed for passenger traffic, railroads must have heavier rails, far stronger rail joints and a more accurately adjusted support on all the ties than are now generally provided. A deeper section of rail allows less wave motion to rails under weight. The serious cutting into ties, by rails causing unevenness of rail support and danger of their spreading, is practically stopped by the use of tie-plates, of which there are three or four good styles having large sales.



Niles Rail Joint.

The most important defect to overcome is weakness of rails at their joints. The rails must be clamped both sidewise and from beneath by a mechanism that in itself is as strong as the rail, and that continuously holds the rails in alignment under any pressure.

The Niles rail joint, shown in the accompanying cuts, combine these requisites in the simplest form, viz.: a truss, base-plate and angle bar. It is made of rolled steel by Messrs. M. C. & S. S. Niles, of No. 111-13 South Canal Street, Chicago.



Rail Joint for Elevated Railroads.

The base-plate is drawn very firmly to bottom of rail by the horizontal bolts and the action of the brace-bar engaging under hook of L bar, and moving inwardly toward a perpendicular. The vertical part of L bar never touches the rail flange. It is essential to a perfect joint that the under surfacing plate be held rigidly to bottom of rails independent of the tie. The Niles joint effects this in a simple and powerful manner. Its action is such that the four horizontal bolts, through the medium of the brace-bar, draw the base-plate and rail together with a constant force of at least 25 tons.

A Good Roofing Material.

The N. & G. Taylor Company's Tinplate Works in Philadelphia continue to work steadily without being affected by the ups and downs of the trade. The demand for this company's standard brands is such as to cause it to increase its facilities. It is now completing the erection of two additional stacks, which are expected to be working shortly, making twenty-two stacks in all.

Notwithstanding an exceptionally hard winter, which has had its effect upon tin house work, the works of this company have been running steadily with the assurance of a large business for the goods during the coming season. The genuine Taylor "Old Style" continues to be the favorite, increasing in sale as the old roofs covered with this fine brand continue to testify to its durability. The Taylor roofing tin, Taylor's "Columbia," and "Knoxall" command a large sale upon their merits. There is one good rule in these works—that every plate must be fully up to the standard in every respect.

Arrangements for Exhibitors at Alexandria Bay.

Arrangements have been made by the Standing Committee of The Supply Men's Association for an ample amount of space for those wishing to exhibit at Alexandria Bay during the June Conventions of the Master Car Builders' and Master Mechanics' Associations. Mr. Chas. W. Crossman, proprietor of the Crossman House, has donated the use of the pavilion, a building 15 feet wide by 60 feet in length, with a veranda 9 feet in width running entirely around it; in addition to which he will, if found necessary, raise a large tent on the lawn.

To insure prompt delivery, consignments should be marked 'Alexandria Bay, N. Y., via Clayton, care of The Crossman House," where they will be received by a special committee stationed on the ground at least a week in advance of the conventions, and transported from and to the wharf free of charge. Those desiring further information should address Mr. W. C. Ford, Secretary, Supply Men's Association, 29 Broadway, New York, N. Y.

Mr. Frank B. Stone, dealer in pine and hard wood lumber, and whose offices are in the Bort Building, 17 to 21 Quincy street, Chicago, makes a specialty of car and bridge building timber.

Improved Car Heaters.

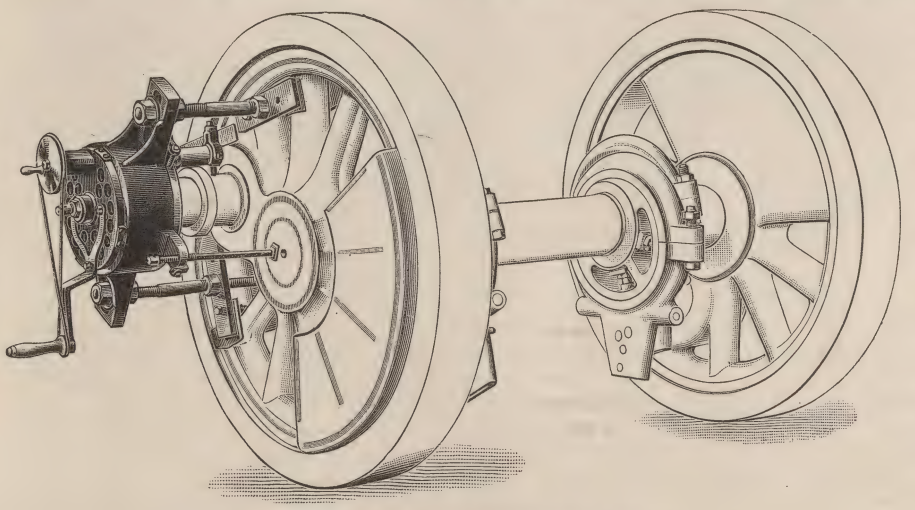
Mr. W. C. Baker, the well-known manufacturer of car heaters, is conducting some experiments at his shops in Hoboken, N. J., looking toward the adoption of a new system of heating passenger cars. The system that Mr. Baker is working to perfect is intended to warm cars in transit by stored heat gradually given off to meet the needs of comfort. For this purpose a cylinder about 20 inches in diameter and 10 feet long is carried beneath the floor of the car. This cylinder is filled with pebbles, and by the passage of high pressure steam through the cylinder the pebbles are heated to a high temperature. This forms a store of heat, and as the usual circulating pipes enter this cylinder and make a couple of turns in it, the circulation of brine in the pipes is kept up and the heat is given off gradually and for many hours. The intention is to heat these pebbles by steam from stationary boilers at terminals, but in case of serious delay on the road the ordinary Baker heater could be brought into use to supply the needed want, as the circulating pipes are connected with the heater as well as the reservoir, or cylinder containing the pebbles.

At the works at Hoboken a very good imitation of a 60-ft. passenger coach is erected, and this furnishes a fairly good means of testing and experimenting with heating apparatus. A representative of the National Car and Locomotive Builder was shown this arrangement on March 20. On this occasion the pebbles in the reservoir had been heated by steam of a 115 lb. pressure (347°) at 6 A. M., and at 1 P. M., seven hours later, the pipes were still warm. Mr. Baker's aim is to store sufficient heat in the reservoir to last during a trip between New York and Chicago. To do this it is probable that a somewhat larger reservoir would have to be used, and the pebbles heated by steam of very high pressure. It is interesting to note, in this connection, that pebbles have been chosen instead of water for the medium of storing heat. Experiments showed that while water held about six times as much heat as the same weight of pebbles, yet the pebbles held the heat longest, giving it off more gradually.

Mr. Baker is also perfecting an improved system for warming street cars. The system is similar to that described above, except that the reservoir for street car service is a 4-inch pipe extending the full length of the car and filled with pebbles. One of these is placed on each side of the car beneath the seats, and the heat is admitted or excluded by a very simple contrivance operated at will by either the conductor or passengers. The writer was shown one of these pipes, the pebbles of which had been heated to about 350 degrees at 7.30 A. M., and at 1 P. M. the temperature of the pipe was about 150 degrees.

Portable Crank-Pin Turning Machine.

The very useful and convenient tool illustrated herewith is especially adapted for use in locomotive repair shops, and is made by Mr. Henry C. Ayer, of the Trenton Avenue Machine Works, Trenton Ave. and Adams St., Philadelphia, Pa. It is very simple in design and most effective in operation. It will turn long or short pins either with or without collars. No offset tools are required, consequently there is no springing of the tool. It can be set with the pointer, with the face of the wheel, or with the bore in the hub of the wheel, where there is no collar. This makes it run perfectly true with the original turning of the pin. For turning pins with two bearings the extension bar is used for reaching the inner bearing. A large shell is used to carry the cutter and act as a frame and guide for the tool. The two large lugs on the shell are used to clamp in solidly to the wheel. The two smaller lugs carry set-screws that merely true it up and act as feet for it to stand on. A large center point screws through the center of the shell to bring the machine true by entering the drilled center on the pin, and there are four jaws on the back of the inside shell that center the collar or the flange of the pin.



Portable Crank-Pin Turning Machine.

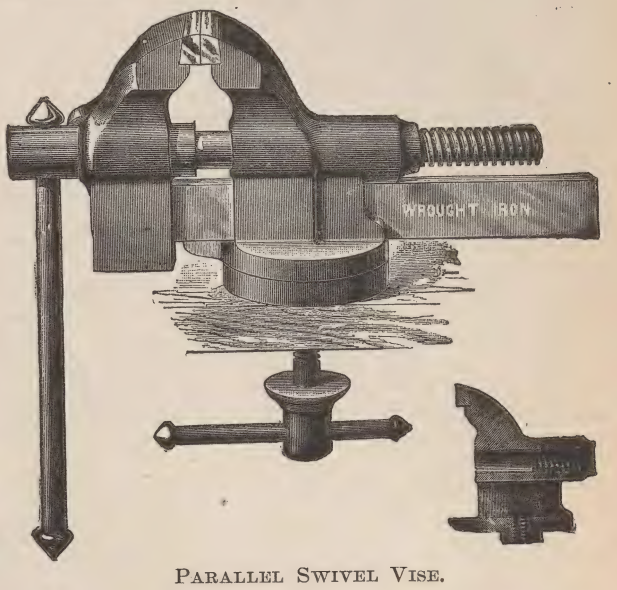
Inside the shell there is a second shell that revolves, carrying a tool-post with it, this tool-post being fed out and in by a screw operated either by hand or the small belt shown. With this device not only the bearing but the faces of the collars can be trued up. When it is desired to turn the inside bearing of a main pin an extension to the tool-post is screwed into place, as shown in the engraving. The machine will true up all pins from 4 to 7¾ ins. in diameter.

"You are at your best, now, Cyrus," said his uncle, "and just at the right age for marrying. You ought make hay while the sun shines." Cyrus immediately put on his hat, went out of the house, and proposed fifteen minutes later to a grass widow.

Merrill's Parallel Swivel Vise.

The excellent design of swivel vise illustrated herewith is made by the Messrs. Merrill Brothers, of 465-71 Kent avenue, Brooklyn, N. Y., and is specially adapted to heavy machine and railroad shop work. Its durability is insured by the wrought-iron bar with its long bearing, the large square screw and the extra long solid box.

For a chipping vise it is quite superior, the jaws being extra heavy, they cannot be broken with a hand-hammer. The screws are large, with a strong, square thread, and well fitted to the solid box. The threaded part of the box in each size of vise is as long as the jaws are wide, thus securing durability.



Parallel Swivel Vise.

The wrought iron bar below the screw is planed parallel, firmly secured in front jaw, and well-fitted to the pocket in the back jaw. The steel jaws are so arranged as to be easily replaced should they become injured or worn. This arrangement makes a strong, compact and solid vise, one that will last many years in daily use.

These vises are made in four sizes, varying in width of from 4 to 8 inches, and in opening from 8 to 12 inches.

He who is too dumb to spend money for other people's enjoyment is smart enough to provide for the welfare of his own family.

"B-b-b boy, kick-kick-kick-call that p-p-p-pup off, d-d-d-do you hear?" "Dere ain't no pup, mister. 'E's growed inter a dorg since yer begun torkin'."

An old man went into a life insurance office and asked to be insured. The company asked his age. His reply was ninety-four. "Why, my good man, we cannot insure you,' said the company. "Why not? he demanded. "Why, you are ninety-four years old." "What of that?" the old man cried. "Look at the statistics, and they will tell you that fewer men die at ninety-four than at any other age."

The Hilles & Jones Co., of Wilmington, Del., manufacturers of equipment for cars and locomotive works, have issued the most elegantly illustrated catalogue that has reached this office in a long while. The engravings, which are in the highest state of the art, show the construction of single, double and combined and multiple punches and shears, plate bending machines and rolls, hand and belt power bending rolls, plate straightening rolls, milling machines, &c., &c.

These tools are not only elegant in design and evidently efficient in operation, but are also massive in construction giving assurance of great strength and durability.

The Great Western Railway Company, of England, is extending the system of steam heating, which was adopted for its corridor train to Birkenhead two years ago, to its ordinary trains, and, in future the whole of its new stock will be fitted up with the necessary appliances. Gas lighting is also to be generally adopted by this road, says *Engineering*, works having been fitted up at London, Swindon, Bristol, Exeter, Wolverhampton and New Milford, while other works will shortly be completed at Worcester, Birkenhead and Cardiff.

Mr. C. L. Pullman, the well-known late contracting agent of the Pullman Company at Chicago, has entirely regained his usual good health and has accepted the Presidency of the Dudley Packing Company, and will have his headquarters in New York City from April 1st.

The Chicago Grain Door Company is filling numerous smal orders for their "Security Lock Bracket" for outside car doors. Their value as a thief-proof device is being tested and admitted.

The Chicago Grain Door Company has recently filled orders for 1,300 Illinois Central box cars now being built by Haskell & Barker Car Company; also a small order for Cairo Short Line box cars being built by the Mt. Vernon Car Manufacturing Company.

Vertical Double Spindle, Hollow Chisel, Mortising Machine.

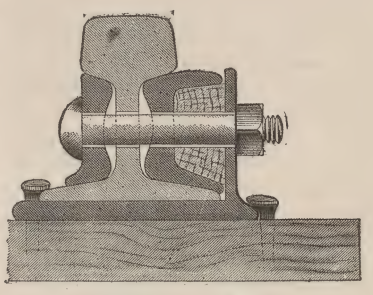
The illustration above shows an entirely new and novel machine, designed particularly for door mortising and other work where there are a number of pieces in duplication. It is especially useful for the best class of hard wood doors, such as are used in railroad and street cars. The machine will do its work rapidly, two door stiles at the same time, they being exact duplicates right and left, so as to frame up absolutely square. It is made by the Berry & Orton Company, of Philadelphia, Pa.

There are two hollow chisels instead of one, being in perfect alignment with each other. The stroke of the chisel bars can be regulated for depth of mortise and can be increased or decreased at will, or stopped at any point of the stroke, the greatest stroke being 6½ inches. They operate automatically. They can also be adjusted to cut to the same depth in case of one chisel being shorter or longer than its mate. The chisels have quick return and will make thirty-five strokes per minute, increasing in number as the strokes are shortened.

Each spindle carriage is provided with a strong clamp, so that when set it can be securely held in position. They are also counterweighted. The chisel has a range across the material of 2 inches for each. All gear wheels are machine cut, those of small diameter being made from steel forgings. The table is of iron, 10 feet long, and planed true. It has a vertical adjustment of 14 inches and a horizontal movement of 10 feet. It is provided with a suitable number of quick acting clamps, which clamp both pieces at the same time, also an ample number of stops, so that when set up no laying out of the work will be necessary.

The Weber Rail Joint.

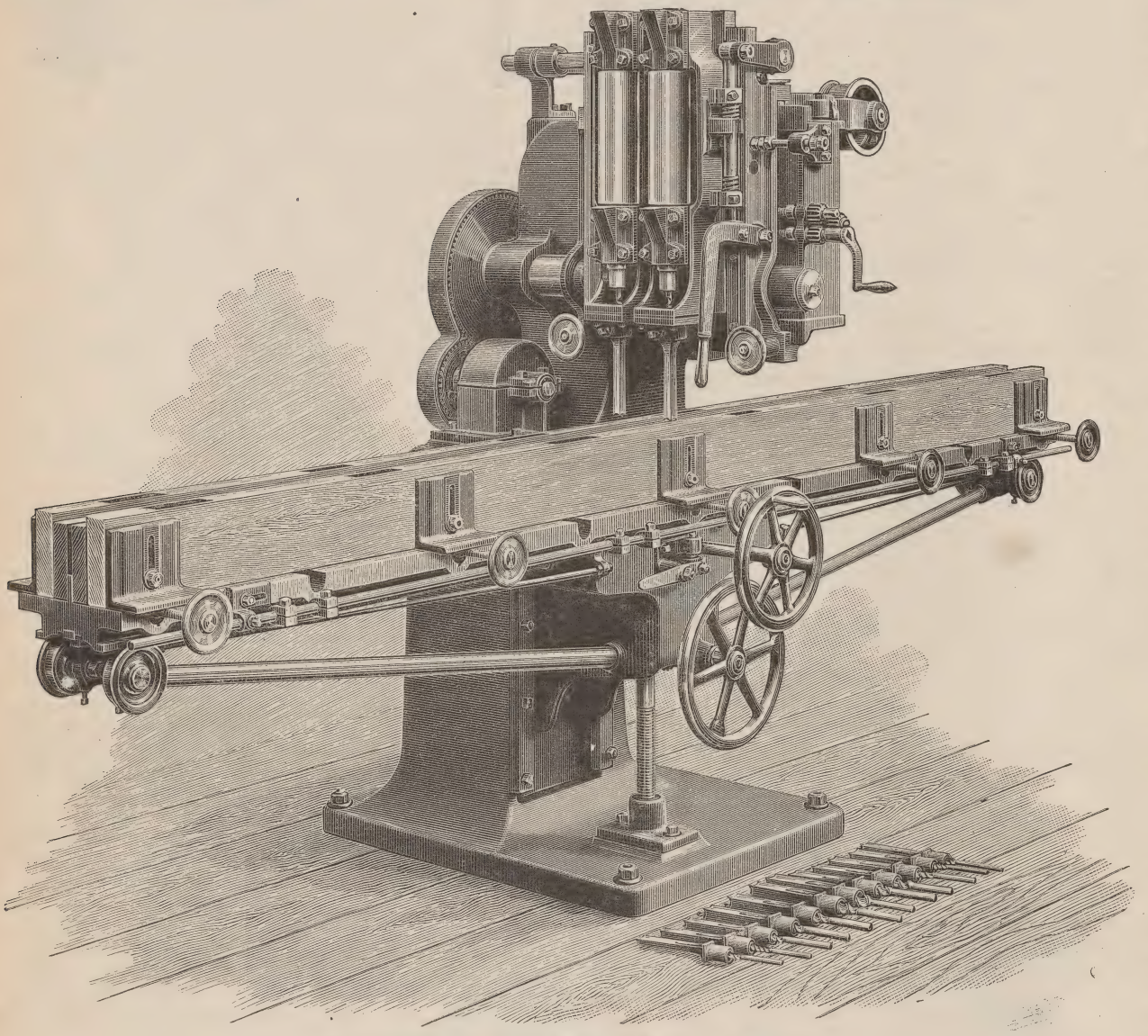
The Weber Railway Joint Manufacturing. Co., with offices in the Cotton Exchange Building, New York, devotes its entire attention to the manufacture of the Weber rail-track joint, which is a fastening for the ends of rails which permanently maintain their surface and alignment. The advantages claimed for this joint are that it prevents the flattening of the ends of rails, acts as a nut lock by preventing loose bolts, reduces the creeping of rails and can be easily fitted to any rail, no matter what punchings it may have, or the style of joint previously used.



Weber Rail Joint.

The construction of this joint is plainly shown in the accompanying cut. The metal used is of the best grade of mild steel, and all parts are rolled. The wood filler is made of Southern pine and is shaped a little too large, so that when the bolts are tightened the wood is squeezed, and gives a slight elasticity to all the fittings, which also has the advantage of a nut-lock. The result of tests made at the Watertown Arsenal, shows that this joint successfully withstood a pressure of 200,000 pounds, while 311,000 pounds failed to break it.

The poker travels by the grate through route.



Double Spindle, Hollow Chisel, Mortising Machine.

The range of the mortising is from ¼ inch to 1¼ inch. In mortises from ½ inch up it will make a blind mortise in a pair of 12-inch stiles, 6½ inches deep, or will mortise through a pair of stiles 6 inches wide. The machine is provided with two chisels and augers each ¼ inch, ⅜ inch, ½ inch, ⅝ inch, ¾ inch, 1 inch and 1¼ inch. Also a countershaft, which is placed overhead, and suitable steel forged wrenches. The tight and loose pulleys are 12 inches diameter, 5 inches face, and are designed to make 800 revolutions per minute. The weight of the machine is 3,600 pounds.

Drop Forged Turnbuckles.

The need of strong reliable turnbuckles has been felt in the construction and maintenance of freight and passenger cars more strongly than in most other forms of construction. The great and varying strains that are thrown on the trussing arrangement of heavily loaded cars in motion fall with undiminished force on the turnbuckles that couple the truss rods. Car builders and car manufacturing concerns will therefore be interested to learn that an improved form of turnbuckle has recently been placed on the market by the Messrs. Merrill Brothers, of 465-71 Kent avenue, Brooklyn, N. Y. These turnbuckles are made without a weld, of one piece of iron, and smooth finished. The ends are drilled by special machinery, so that they are true in line, and threaded U. S. standard thread.

Recent tests of these turnbuckles, conducted by Messrs. Fairbanks & Co., showed the following results after the buckles had been stretched 25 per cent., or one-fourth of their length:

The	1¼	inch	turnbuckle	stood	a pull of	85,920	pounds.
"	1⅜	"	"	"	"	93,600	"
"	1½	"	"	"	"	119,440	"

Mr. Lewis K. Davis, Consulting Engineer, with offices in the Manhattan Life Building, New York City, is giving special attention to railroad properties and industrials, and to examinations of these for investors.

The Q. & C. Company, of Chicago, manufacturers of railway specialties and special machinery, has issued a new catalogue of the different kinds of saws for both wood and metal, specially adapted for car and locomotive shops, which it manufactures. The pamphlet also gives some "saw suggestions" which contain very good advice on the management and care of saws of the character named above.

The railway and general supply machinery and tool business heretofore conducted under the firm name of M. M. Buck & Co., of 210-14 North Third street, St. Louis, Mo., has been sold and transferred to the M. M. Buck Manufacturing Company, who will continue the same. The present organization comprises the members of the old firm, the officers now being Messrs. M. M. Buck, President; A. H. Handlan, Vice-President and Manager, and E. W. Handlan, Secretary and Treasurer.

The Henry C. Ayer and Gleason Co. has been dissolved by mutual consent. The manufacture of special tools for railway repair shops, a line of tools originally introduced by Mr. Henry C. Ayer, will be continued at his new location, as he is obliged to devote all of his time to this work. His office at No. 919 Betz Building will be discontinued, and the business will be conducted under the name of Henry C. Ayer, Trenton Avenue Machine Works, S. E. cor. Trenton avenue and Adams street, Philadelphia, Pa.

Messrs. Geo. B. Carpenter & Co., of 202-8 South Water street, Chicago, have issued a well illustrated catalogue of the articles they manufacture, which include switch ropes, wire and hemp ropes of all kinds, waste, signal flags, bunting, packing, bell cords and hose.

The Goulds Manufacturing Co., of Seneca Falls, N. Y., and 16 Murray street, New York City, has issued an exceptionally well printed and illustrated catalogue of the very extensive variety of pumps and hydraulic machinery it manufactures, as well as pump supplies, etc. The book contains a seven-page index and 356 pages.

Mr. William W. Lobdell, Secretary of the Association of Manufacturers of Chilled Car Wheels, has issued a very nicely printed pamphlet on the subject of cast iron chilled car wheels at the request of the Association at its last annual meeting. The pamphlet has the indorsement of the Association, and treats of the modes of manufacture of these wheels and the relation they bear to economy in railway practice. Mr. Lobdell is President of the Lobdell Car Wheel Company, of Wilmington, Del. Those interested in the subject of good car wheels should procure and carefully read one of these interesting little books.

The Buffalo Seal and Press Company, of Buffalo, N. Y., makes a specialty of the manufacture of Boughton's safety car seals and presses. These seals are intended for sealing cars, warehouses, etc., and provide an absolutely reliable means of quickly locating losses in transit. Each seal is numbered consecutively, and they are issued to the different station agents the same as railroad tickets are—by numbers. By this system every car sealer has to account for every seal he uses, and give the number of the car it was used upon as well. It will be seen at a glance that no more seals will be found lying around in switch-houses as is the case to-day; while on the contrary every sealer will guard his seals as he would his dollar bills, for he knows if he loses or gives one away it will be detected at once.

The Tandem Car Brake Company, of Toronto, Can., has placed on the market a novel type of brake that acts simultaneously on the wheel and track. The "Tanden Brake," as it is called, is the combination of a wheel brake and track brake, acting simultaneously, the one shoe on the wheel and the other shoe on the track when the lever is applied. The wheel shoes stop the wheel, and the rail shoes stop the car and take up the momentum without any perceptible jar being felt by the passengers or noticeable in the car. Its action is quick and absolute, and its power is so great that the whole weight of the car can be made to rest on the rail shoes. It is applied in the ordinary way, and always follows the radius of the wheel, so that in rounding curves the track shoe is always on the rail and brakes just as effectively on a curve as on the straight rail. With this brake it is claimed that when applied the friction is so equally distributed between all its shoes that sanding the rail is very seldom necessary.

Our Directory.

OF OFFICIAL CHANGES IN MARCH.

We note the following changes of officers since our last issue. Information relative to such changes is solicited.

Abbeville & Waycross.—R. V. Bowen is appointed Receiver.

Boston & Albany.—W. H. Taft is appointed Purchasing Agent, with office at Boston. T. B. Purvis, Jr., is appointed Superintendent of Motive Power, with offices at Springfield, Mass. C. H. Barnes, Master Mechanic at Springfield, is transferred to Boston.

Caledonian.—John F. McIntosh is appointed Locomotive Superintendent, vice John Lambie, deceased.

Chesapeake, Ohio & South-Western.—Geo. Dickey is appointed General Master Mechanic, vice S. R. Tuggle, resigned.

Des Moines & Kansas City.—President M. V. B. Edgerly died March 18th.

Forth Worth & Denver City.—E. W. Hayes is appointed Superintendent of Motive Power.

Fountain Head.—T. D. Stanton is appointed General Manager, with office at Knoxville, Tenn., vice M. O. French, resigned.

Illinois Central.—W. S. Hessman is appointed Master Mechanic at Water Valley, Miss., vice George Dickey, resigned.

Jacksonvile, St. Augustine & Indian River.—George A. Miller is appointed Acting Master Mechanic, vice E. T. Silvius, resigned.

Lehigh Valley.—David Clark, Master Mechanic at Hazleton, has resigned, and is succeeded by Phillip Wallis.

Lehigh & Hudson River.—Master Mechanic Scott Mills has resigned.

Mexican Interoceanic.—John Preston, Master Mechanic at at Pueblo, is transferred to Vera Cruz.

Monongahela Connecting.—W. W. Willock is appointed General Manager, with office at Pittsburgh, vice W. C. Quincy, deceased.

Montgomery, Tuscaloosa & Memphis.—Geo. B. Shellhorn is appointed Receiver, with office at Montgomery, Ala.

New York Central.—F. W. Chaffee is appointed Division Master Car Builder at West Albany, N. Y., vice L. Packard, deceased.

Oregon Short Line & Utah Northern.—John M. Egan is appointed Receiver.

Ottawa & Gatineau.—P. W. Resseman is appointed General Superintendent, with office at Ottawa, Ont., vice J. T. Prince, resigned.

Pennsylvania.—W. H. Potter is appointed Superintendent of the Toledo Division, vice J. S. Morris, deceased.

Poughkeepsie & Eastern.—E. C. Osborn is appointed Acting General Manager, vice W. N. Sheldon, deceased.

San Antonio & Gulf Shore.—Henry Terrell is appointed Receiver. John Ireland is chosen President, vice G. G. Clifford, who is made Vice-President and General Manager.

Seaboard Air Line.—Wm. R. Meed is appointed Superintendent of Motive Power and Machinery, vice James Maglenn, resigned.

Southern Pacific.—F. W. Mahl is appointed Mechanical Engineer, with office at Sacramento, Cal.

Wabash.—S. W. Jeffery, Master Mechanic at Springfield, has resigned, and is succeeded by Geo. W. Mudd.

Wisconsin & Michigan.—J. J. Coleman is appointed General Manager, with office at Menominee, Mich.

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NATIONAL CAR LOCOMOTIVE BUILDER

MAY, 1895.

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The Southern Railway is to build 200 furniture cars at once.

The Union Tank Line is building 50 tank cars at its Buffalo shops.

The Chicago & South Bend road is in the market for 50 furniture cars.

The Grand Rapids & Indiana is about to order four consolidation locomotives.

The Calumet & Blue Island Railroad Company is in the market for 200 box cars and some locomotives.

The Pennsylvania Railroad is to erect a new roundhouse and a car and machine shop at Blairsville, Pa.

The Pullman Company is building three first-class coaches for the Indianapolis, Decatur & Western.

The Toledo, St. Louis & Kansas City will soon purchase two freight locomotives and 500 tons of steel rails.

The shops of the Trinity, Cameron & Western Railroad, the "Link Line," are to be located at Cameron, Tex.

The Unadilla Valley Railroad has ordered a 10-wheel freight engine of the Rhode Island Locomotive Works.

It is reported that all the mechanics employed by the Baltimore & Ohio Railroad were put on piecework April 1.

The Atlanta & West Point Railroad is in the market for 100 ventilated box cars, to be used in the shipment of fruit.

The Cleveland, Lorain & Wheeling has ordered 100 hopper-bottom coal cars of the Michigan-Peninsular Car Co.

The Kansas City Refrigerator Car Company has placed an order for 58 refrigerator cars with the St. Charles Car Works.

The Houston, East & West Texas Railroad will soon replace three of its old narrow gauge engines with new locomotives.

The Wabash Railroad added three parlor cars to its passenger equipment in April. They are veritable palaces on wheels.

Among the laws passed by the North Carolina legislature, recently adjourned, was one requiring railroads to redeem unused tickets.

A bill to punish the crime of train robbery by not less than 15 years of imprisonment has passed the Pennsylvania legislature.

A contract to rebuild 300 refrigerator cars for the Baltimore & Ohio Railroad has been given to the South Baltimore Car Works.

The South Baltimore Car Works are building an increased number of the Campbell & House combination freight and stock cars.

The Rhode Island Locomotive Works has an order for six Forney engines for the Boston & Maine, for its suburban service out of Boston.

M. W. Parker, a well-known business man of St. Johns, Mich., fell from a Burlington train at Aurora, Neb., April 5, and fractured his skull.

The Ensign Car Manufacturing Company, of Huntington, Pa., after an idleness of several months, started up April 8 with 1,200 men on full time.

The Georgetown & Trinity Railroad, which is being built in Texas, has given an order to the Pittsburgh Locomotive Works for 12 locomotives.

The Bloomsburg Car Manufacturing Company, of Bloomsburg, Pa., is building a large number of platform cars for one of the Mexican railroads.

The Rogers Locomotive & Machine Works, of Paterson, N. J., has sold to the Poughkeepsie & Eastern an 8-wheel passenger locomotive with 17 by 22-inch cylinders.

The annual report of the Pittsburgh, Shenango & Lake Erie shows that the gross earnings of the road for the past year were $476,651.22, and that the net earnings were $165,133.60.

The 500 hopper cars being built by the Lenoir Car Works for the Southern Railway are being turned out at the rate of five and six a day. These works are situated at Lenoir City, Tenn.

The St. Louis Merchants' Bridge Terminal Railway has given an order to the Coates Manufacturing Company, of Columbus, O., for the equipping of its engines with fuel oil burners.

A broken journal caused the wreck of a freight train on the New York, Lake Erie & Western, April 1, resulting in the death of a brakeman and the destruction of six cars and their contents.

The roundhouses and machine shops of the Atlantic & Pacific Railroad at Winslow, Ariz., were burned on April 8, and eight locomotives were seriously damaged, the total loss being given as $100,000.

The Buffalo, Rochester & Pittsburgh has made arrangements with the Brooks Locomotive Works for the rebuilding of a number of locomotives, which have been awaiting general repairs for some time.

The Standard Air-Brake Company, of New York City, has been incorporated, with $50,000 capital stock, by Henry Seligman, Albert Strauss, Theodore Seligman and E. D. Phillips, all of New York City.

The prices of good second-hand tools and other machinery have generally advanced, and this is regarded as a very good indication by those whose business it is to watch symptoms.—*American Machinist.*

On April 14 a Wabash freight train containing 22 cars made the run from Andrews to Tilton, 125 miles, in four hours. This is regarded as one of the best performances ever made by a freight train in the West.

The Louisville, New Albany and Chicago Railroad Company is reported to have provided about $1,000,000 cash to pay off its floating debt, take up equipment obligations and defray the expense of important improvements.

The car shops of the Grand Trunk Railroad at London, Ont., generally employing about 200 men, are to be abandoned, and the work now done at those shops will be transferred to the shops at Toronto and Brantford, Ont.

The Delaware & Hudson has given an order to the Jackson & Woodin Manufacturing Company, of Berwick, Pa., for 150 box cars of 60,000 lbs. capacity. The cars will be 34 feet long and will be equipped with Westinghouse brakes.

The Seaboard Air Line has given an order to the Richmond Locomotive & Machine Works for five 19-inch by 24-inch 10-wheel freight locomotives and seven 8-wheel locomotives with same size of cylinders, for passenger service.

The Missouri Car and Foundry Company of St. Louis is building 25 gondola cars for the Kansas City, Osceola & Southern. The cars are to be 34 feet long, 60,000 pounds capacity and are to be equipped with air brakes and Gould couplers.

The "Big Four" earned in March $1,102,844.76, an increase over March, 1894, of $47,503.15. In March there were loaded at stations on the Big Four system 27,692 cars; the road received from connections 35,440 loaded cars, making a total of 63,132, an increase over March, 1895, of 5,773 cars.

The Wagner Palace Car Company is making all its new cars with wide vestibules and is putting a single pane of plate glass in the doors. The effect of this construction is very handsome. Many of the old cars are being remodeled in this way.

The Union Car Company, of Depew, N. Y., has a contract for 100 refrigerator cars from the Chilean Government. This company is putting up an addition to its works, and when it is completed it will have room to work under cover on 500 cars.

The Michigan Central car shops in Detroit are building a number of furniture cars at the rate of two a week. They are also building three special horse cars for the use of the American Express Company on the Michigan Central. Work in all the shops of this company has just been increased to nine hours a day.

The Southern Railway has ordered six 10-wheel 20 × 24-inch passenger engines and eight 20 × 26-inch consolidation engines of the Richmond Locomotive Works. These works are also building for the Southern Railway a 10-wheeled compound locomotive for passenger service, with cylinders 20 × 32 × 24 inches.

The Pittsburgh Locomotive Works recently completed two heavy locomotives for the Pittsburgh Junction Railroad. The engines have eight driving wheels, 42 inches in diameter, with a total wheel base of 23 feet. They weigh 160,000 pounds, with 148,000 pounds on the drivers. The cylinders are 22 inches × 28 inches.

The Seaboard Air Line has equipped at its shops at Raleigh (N. C.) an air-brake instruction car. The car is completely equipped with all the air-brake appliances for an engine, tender and 12 cars. Sectional models complete the equipment. The Wabash Railroad has now in course of construction at its Moberly (Mo.) shops a somewhat similar car.

The Wabash has shortened its running time between Kansas City and St. Louis to eight hours, distance 277 miles, with 20 stops and 25 minutes for dinner. This means fast running and a good roadbed. The Wabash has the shortest line between the two cities and now makes the shortest time, the train making this being the fastest train that enters St. Louis.

The Pennsylvania Railroad Co. has sued the city of Chicago for $46,010.44 damages for property destroyed during last July's strike, consisting of 32 box cars, 38 stock cars, 1 refrigerator car, 1 coal car, 175 crossties, 1 frame building, 2 targets, 1 yardmaster's office and furniture in same, 1 passenger station at Fifty-first street, 4 milk trains, 25 miles of track, and 1 lot of merchandise.

The Grand Trunk shops at Montreal have lately turned out two handsome new colonist sleeping cars which will run between Halifax and Montreal. These cars are finished in mahogany and upholstered in leather. There are two lavatories at one end, fitted up with marble and handsome mirrors, and a smoking compartment at the other end. Each car has sleeping capacity for 52 passengers.

The Chesapeake & Ohio is having a 10-wheel compound locomotive with 20-inch by 32-inch by 24-inch cylinders built by the Richmond Locomotive & Machine Works. The engine will be exhibited at the Atlanta Exposition and then used in passenger service on the mountain division of that road, hauling the vestibuled ("Fast Flying Virginian") trains between Charlottsville and Clifton Forge.

The new shops of the Southern Railway, at Knoxville, Tenn., will probably be ready for operation about June 1. In some respects they will be about the most interesting shops in the country. Over $500,000 has been invested in their construction and equipment with modern tools and machinery. They will be capable of keeping in repair 150 locomotives, 300 passenger coaches and 8,000 freight cars.

The Choctaw, Oklahoma & Gulf Railroad is in the market for about 500 stock cars of 60,000 pounds' capacity. It is also in the market for eight coaches, four combination and four express cars, and has placed an order with the Baldwin Locomotive Works for four eight-wheeled passenger and six consolidation engines. These are to be equipped with the National hollow brake beams, Detroit lubricators and Sellers injectors.

The Barney & Smith Car Company, of Dayton, O., is building 16 cars for the Nantasket Beach division of the New York, New Haven & Hartford Railroad. As was first announced in the NATIONAL CAR AND LOCOMOTIVE BUILDER, this division is to be supplied with electric equipment. The trucks for these cars are being made by the Baldwin Locomotive Works of Philadelphia, and the motors are to be furnished by the General Electric Company, two motors of 100 horse power each being supported by each truck.

The annual meeting of the Chicago & Alton Road was held April 1. The report as to earnings showed those of the passenger department to have been $2,043,912 in 1894 as compared with $2,900,819, a decrease of $856,907; freight earnings of 1894 were $3,881,544, as against $4,275,117 of 1893, a decrease of $391,573; gross earnings were $6,292,236, against $7,566,640, a decrease of $1,274,404. Net earnings decreased, $247,242. The showing, in having been able to pay a dividend of 2 per cent. quarterly all the year, was a very favorable one.

The Pennsylvania Railroad has fitted up a large restaurant on the sixth floor of its Broad street station in Philadelphia. The offices of the company are now located in this building, and employ about 1,500 people. The restaurant is for the exclusive use of these, and is to be conducted at no profit to the company, everything being sold at cost price, which is about half what is charged at even the cheap restaurants; for instance, a piece of pie and a glass of milk will be given for five cents, while outside such a lunch would cost double that sum.

Southern Railway Standard Hopper Car.

Through the courtesy of Mr. R. D. Wade, Superintendent of Motive Power of the Southern Railway, we are enabled to present herewith the general arrangement drawings of the newly adopted standard coal cars of this company, together with considerable descriptive matter of the construction of the same. The cars have hopper bottoms and 500 are now being built by the Lenoir Car Company, of Lenoir City, Tenn. They have a capacity for 60,000 pounds of coal, and are of the most improved design in every particular. The length of the framing over the sills is 28 feet, the width is 8 feet, and the interior length of the box is 25 feet 8 inches and the width 7 feet 7 inches. The height of the box is 5 feet above the floor. The following table gives a condensed statement of the material used in the construction of the car:

Pine lumber	2,036 ft.	Carriage bolts	206 lbs.
Oak "	1,698.7 ft.	Nuts	118 "
Castings, not including drawbars	1,278 lbs.	Lag screws	23 "
Forgings	2,093¾ "	Nails	25 "
Bolts and rods	1,140½ "	Chain	36 "
		Springs	71 "

The specifications require that all pine lumber for the frame shall be of sound, virgin, long leaf, Southern pine, cut not less than three months before using, free from large or unsound knots, shakes through or around and all other defects. Any piece having on corners more than one inch of sap, measured diagonally across the corners, is rejected. All oak framing lumber must be be cut full size and from live trees, free from rotton spots or worm holes, large, loose or unsound knots, shakes and splits; well squared up at corners and cut not less than three months before using. All boards, posts, stakes, etc., must be thoroughly seasoned, either in air or in dry kiln.

The side sills are 5½ by 10½ inches, and are framed to the end sills with double tenons 2 inches thick, 2 inches long and 5½ inches wide, spaced 2 inches from top of sill, and 2 inches between tenons. They are gained for the body bolsters, to which they are fastened with ¾-inch bolts, two at each end; and are gained for the cross-pieces and incline irons. The center sill is 9 by 9½ inches, and framed to the end sills with double tenons of the same thickness and length, and spaced the same as those of the side sills; they are mortised for the cross-pieces, and gained for the body bolsters and brake carrier irons. The intermediate sills are 4 by 9 inches, and are framed to the end sills and cross ties in the same manner. All the longitudinal sills are of pine.

The end sills, cross ties, bolsters, and draft timbers are all made of oak. The end sills are 6½ by 10½ inches, and mortised to correspond with the tenons on the longitudinal sills; the mortises hug the tenons snugly and are ⅛ inch deeper than the length of the tenons. They are fastened to the cross-ties with ⅞ and 1-inch tie rods, having 1⅛ and 1¼-inch ends, respectively, four in each end.

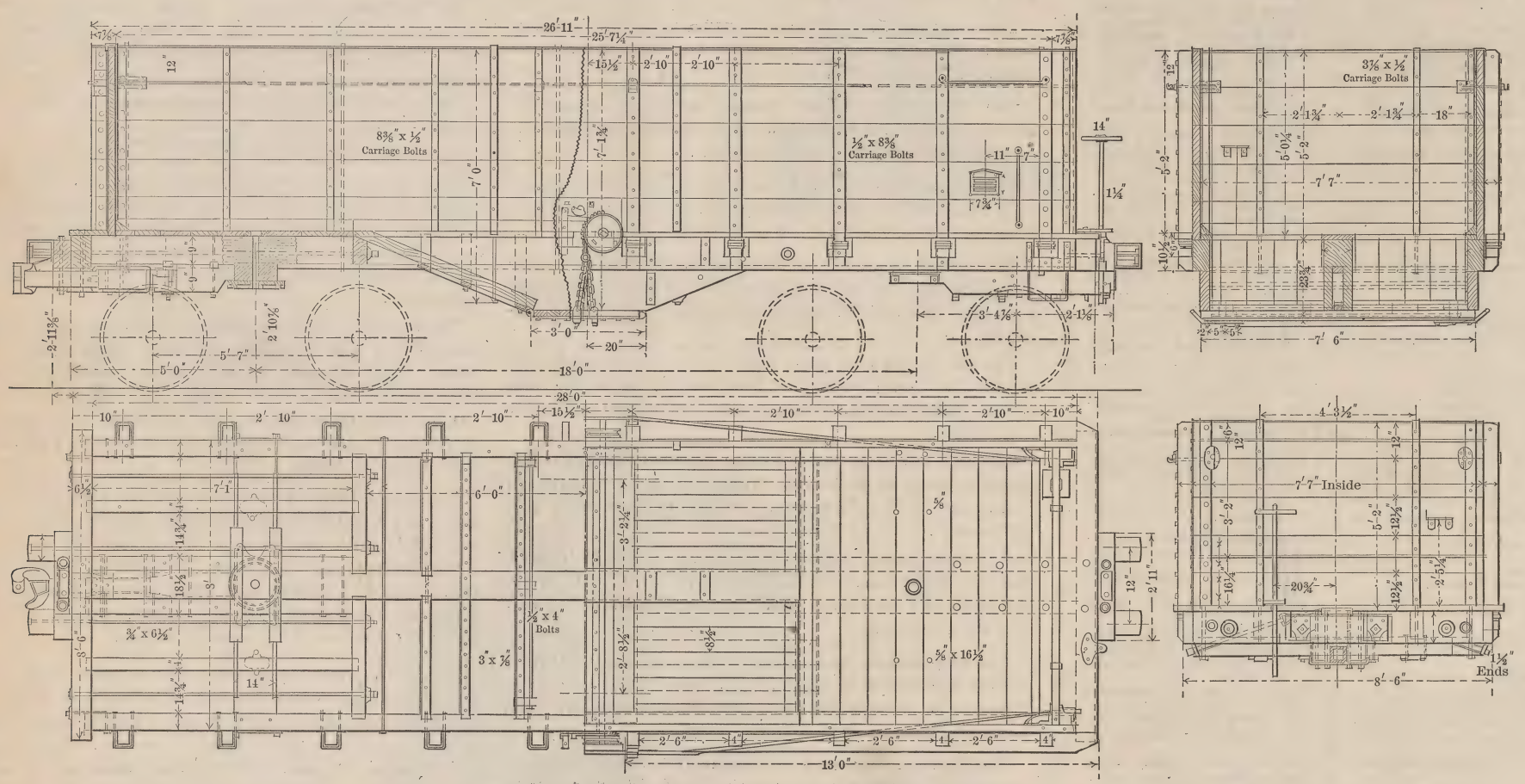
The cross-ties are 4½ by 9 inches, and are framed to the center sills and side sills with double tenons, 1 inch long, 2 inches thick and spaced 2 inches from top of sills and 2 inches between tenons. They are mortised for intermediate sills and are beveled on top to receive the hopper floor. The body bolsters are 6 by 14 inches, and are gained for the truss rods and notched for the sills and draft supports. The side bearings are secured to these by ⅝-inch bolts.

The supports for draft timbers are 4½ by 9 inches, and are framed to the end sills with double tenons of the same length and thickness, and spaced the same as the tenons of the sills, and 4½ inches wide; they are gained for the body bolsters and anchor blocks and fastened to the center sill with seven ¾-inch bolts. The draft timbers are 5½ by 9 inches, gained for the tie plates and anchor bolts, and notched for the buffers. They are fastened to the supports by three ⅞-inch bolts passing through the anchor blocks, and to the end sills and buffer blocks by one ⅞-inch bolt through each.

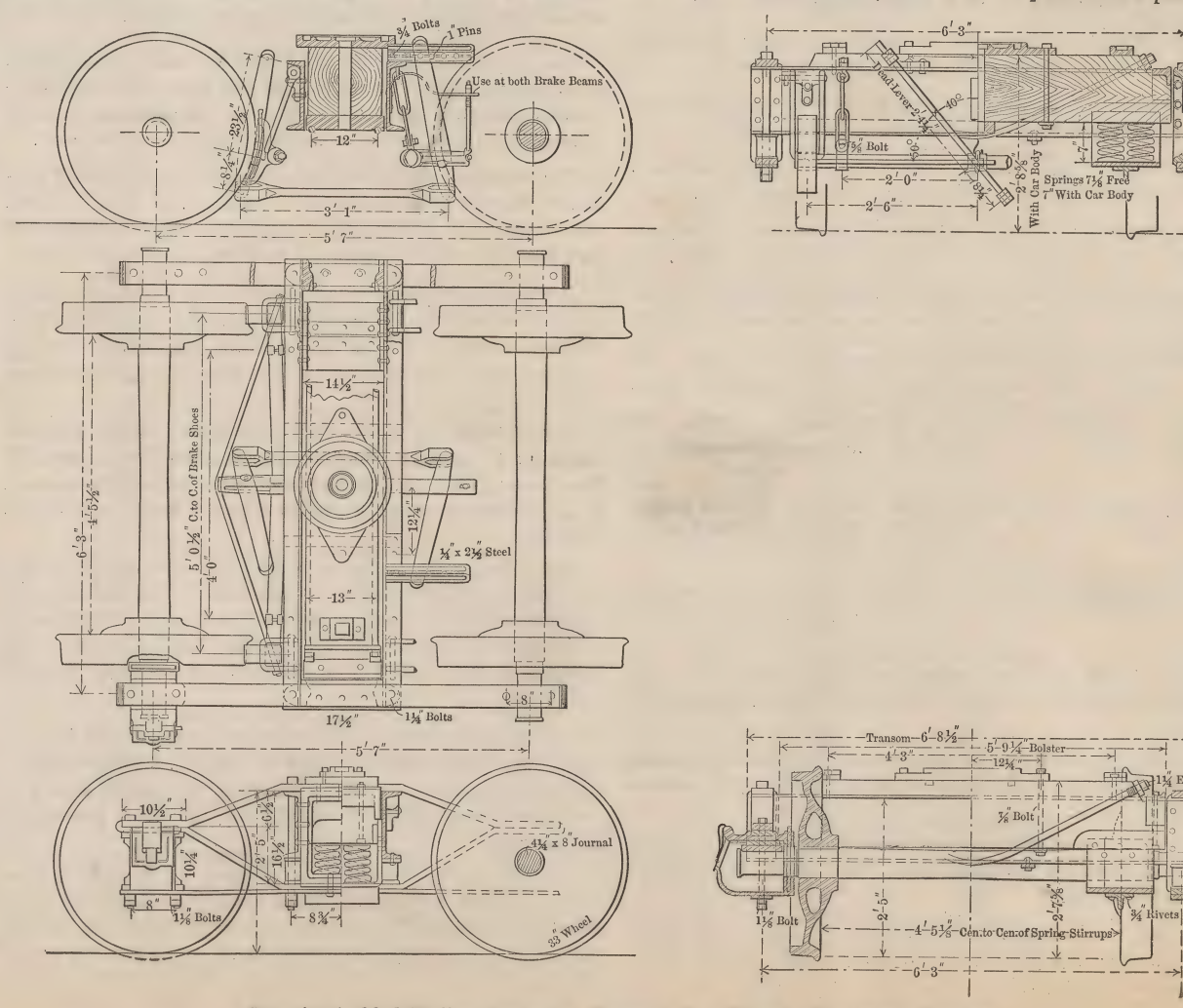
The flooring is of the best quality of seasoned heart pine, dressed and matched 1¾ inches thick, not over 10 inches wide and fastened down by 20d. steel wire nails. All bolts through the sills whose heads pass through the floor fit into cast iron head sockets let into the floor. The same arrangement obtains for the king bolts. Around the sides and ends and spiked to the sills is a beveled mounting. The floor of the hopper is double and is constructed as follows: The incline irons being put in place and bolted to the sills, the bottom or main floor is put down and fastened to them, using ½-inch carriage bolts, heads let in flush, which is done by running a gain across the top side of floor 1½ inches wide by ½ inch deep, using a tie plate 1⅛ inches by $\frac{3}{16}$ inch, with square holes punched in it for the shanks of the bolts. The floor is 2¾ inches thick finished, and made of boards of the uniform width of 8½ inches. On top of this, arranged so as to break joints, is spiked a false floor 1¼ inches thick of the same width as the lower floor, in which steel wire nails 3 inches long are used, nine in each board. The hopper doors are of the best quality of oak lumber, dressed 2 inches thick, tongued and grooved, and provided with wrought hinges and chain.

The hopper is fitted with a 2-inch windlass shaft, bearings, sheave wheels, pawl and a $\frac{7}{16}$ inch chain (as shown on the side elevation). The bearings are bolted to the sides and sills, using ¼-inch boiler plate for the same. Wrought iron yokes and hinges are attached to the doors, and to the sills and flooring of the incline. The filling in the center of the hopper is fastened to the center sill with ¾-inch bolts, having beveled cast washers on outside of yokes, and plates on inside of car. Special care is taken to have the hopper chains the same length, and to have the doors fit up well against the floor and sides of the hopper.

The sides and ends are 2½ inches thick finished, 4 pieces high; 3 pieces 12½ inches wide and one on top 12 inches wide. They are fastened to the posts, stakes and hook straps by ½-inch bolts, and tied to the side sills, side of hopper and intermediate sills with ¾-inch bolts running through them and ¾-inch strap bolts in the inside. There is also a 2½-inch by ¼-inch tie plate on top of both sides and ends. Running the whole length of the car, 47¾ inches above the floor, and in the joint of the top plank is a ¾-inch truss rod, having ⅞-inch ends, and fitted with corner castings, queen posts and end washers. The ends are fitted with two cast-iron steps; one on the inside and one on the outside. The posts are 3½ inches by 4 inches. They are set on top of the floor on the outside of the ends, and bolted to the sides and ends with ½-inch bolts, two in each plank. The stakes are 4 inches by 5 inches and are driven into the pockets with a sledge hammer, filling each pocket on all sides with a shoulder projecting ½ inch and tapering to 4 inches on top. They are chamfered on the edges, beveled on the bottom, and fastened to the sides, each with 10 ½-inch bolts passing



Standard Hopper Bottom Coal Car, Southern Railway.



Standard 60,000-lbs. Capacity Freight Car Truck, Southern Railway.

through a 2-inch by ¼-inch washer-plate on the inside of car, and which is provided with square holes to receive the bolts. The top of each stake is clamped by a ½-inch bolt, and a ½-inch bolt passes through the bottom of the stake and side sill. Washer-plates ¼ by 2 inches are also put on the outside of the sides and ends to receive the bolts passing through the corner posts and strap bolts.

All tenons are white-leaded around the joints before the work is put together, for which the best white lead is used as thick as it can be worked. Wherever there is a bearing of iron against wooden parts an additional heavy coat of mineral paint is given the wood. After the framework is put together, the top of the sills are painted, for which mineral paint as thick as it can be worked is used before the floor is put down. The beveled mounting on top of the floor and sills is given a coat of white lead before being spiked down. The car body is finished with three coats. All ironwork exposed to view is given a heavy coat of black asphaltum.

All bolts used are riveted on the ends; the nuts and bolt heads are of the Southern Railway standard, the screw threads being United States standard. The standard freight car truck of the Southern Railway is used for these cars, and drawings of it are presented herewith. It is designed for 60,000-lbs. capacity cars, and has Master Car Builder standard axles, journals and journal-boxes. The drawings show so plainly its construction and the dimensions of its parts, that further description is unnecessary. The Master Car Builder couplers are used, and also the Westinghouse air-brake equipment.

National Convention of Railroad Commissioners.

The seventh annual convention of Railroad Commissioners will be held in Washington May 14.

At the last convention committees were appointed on the following subjects and directed to report to the next convention:

Railway statistics.
Uniform classification of freights.
Legislation.

The following resolution was adopted at the previous meeting:

"That a committee of five be appointed to select officers for and subjects to be presented at the next annual convention of this association, to solicit papers upon the same, either from members of the association or from those not connected with the organization, and to prepare, as far as possible, a programme of proceedings;" and the following "Committee on Organization and Programme for the next convention" was named: I. B. Brown, of Pennsylvania; J. W. Luke, of Iowa; J. W. Yantis, of Illinois; James W. Rea, of California; Edward A. Moseley, of the Interstate Commerce Commission.

Mr. Ailan Fort, of Georgia, Chairman, makes the following announcement:

"Members of former conventions are entitled to participate in the discussion of subjects at the coming meeting. The various State commissions should be represented by full boards, as far as possible, and to that end all railroad commissioners are earnestly requested to attend the coming meeting. It has been suggested that a session of three days would be advisable in view of the important topics which are likely to come before the convention for consideration."

High Locomotive Mileage.

It is coming to be more generally recognized that the best way to get the most service out of a limited number of locomotives on a railroad is to keep them busy most of the time, operating them either in a pool or with double crews. To what extent this may be carried is indicated in the following table, showing the performance of the engines, 83 in number, on a division of the Missouri Pacific Railroad:

23	engines	making	more	than	4,000
21	"	"	"	"	4,500
24	"	"	"	"	5,000
12	"	"	"	"	5,500
2	"	"	"	"	6,000
1	engine	making			9,114

The exceedingly high mileage of the last mentioned engine (9,114 miles) was made with but one delay of 20 minutes. The average mileage of all the engines was 4,742 miles; and the average mileage per ton of coal was 33 miles.

The Intercontinental Railroad.

The intercontinental railway route, as surveyed under the auspices of the Pan-American Congress of 1889, is now said to have been approved by all the States interested. Lieutenant Commander R. M. G. Brown, U. S. N., the executive officer of the survey, is now about to make his report to the Government. He claims it is feasible to commence the construction of a railway. 4,900 miles long, from the southern boundary of Mexico to the northern terminus of the Argentine railway system. In this distance 230 miles are already constructed, and about 1,800 miles under survey and construction. The longest link for construction would be that between the railways of Costa Rica and Cuzco, Peru, a distance of about 2,300 miles. In the 2,189 miles between Cuzco and Buenos Ayres some railways already built or projected could be utilized.

Association of Railroad Air Brake Men.

The second annual convention of the Association of Railroad Air Brake Men was held at the Lindell Hotel, St. Louis, Mo., April 9 and 10. The officers of the association are: President, S. D. Hutchins, of the "Big Four"; First Vice-President, A. J. Cota, C., B. & Q.; Second Vice-President, R. N. Martin, Pennsylvania Company; Third Vice-President, M. E. McKee, Great Northern; Secretary, P. M. Kilroy, Cotton Belt; Treasurer, Otto Best, N. C. & St. L.

The convention opened Tuesday morning, April 9, with 67 members present. Secretary Kilroy reported the organization to be in excellent condition, with a total membership of 103 active and 27 associate members, some 30 new members having joined during the past 12 months. Treasurer Best reported a total of $477.75 receipts during the year, and an expense account of $383.50.

Tuesday and Wednesday were devoted to the discussion of the reports of standing committees. The following is a list of subjects reported on by committees and discussed during the meetings of the convention:

Pump Governors and Air Gages, Foundation Brakes, Care of Signal Apparatus and Conductor's Valve, Care of Engineer's Brake Valve, Economical Oiling and Cleaning of Brake Cylinders, Main Reservoir and Connection, Maintenance of Freight and Passenger Brakes, Handling of Trains on Mountain Grades, Driver and Engine-Truck Brakes, Slid Flat Wheels, Slack Adjusters, Piston Rod Packing.

St. Louis Terminal Improvements.

The elevated extension of the Merchants' Bridge & Terminal Railway in St. Louis has been completed, and train service was inaugurated over it by the Missouri, Kansas & Texas and the Burlington, which thus secures an entrance into the Union Station. For many years the terminus of the line has been at Seventh and Gratiot streets, and work was begun last October on the extension to effect a connection between the latter point and the Union Station. The elevated structure is double track and is 2.2 miles long, extending from Seventh and Gratiot streets to the yards of the Terminal Railway Association at Biddle street.

The Burlington, which has heretofore used the tracks of the Wabash from St. Peters for its St. Louis inlet to the Union station, will now use its own line via the Bellefontaine bridge and North St. Louis, and its passenger trains will arrive and depart over the elevated line. The Missouri, Kansas & Texas has heretofore used the Broadway and Mullanphy street terminus of the Burlington on the outskirts of the city for its through passenger trains, and the completion of the elevated line gives it a much desired entrance into the heart of the city.

A Combination Storm.

A combination sand and snow storm swept over Kansas and Eastern Colorado April 7 and 8, completely demoralizing train schedules and causing serious inconvenience and discomfort to travelers. The flakes of snow and particles of sand mingled, and were driven across the prairies at a terrific speed by the gale, which blew incessantly for two days. There was no loss of human life, because the storm was not accompanied by the usual degree of cold, but many cattle and horses in Western Kansas are reported to have been suffocated by the whirling clouds of sand. The sand and snow filled up the railroad cuts and buried the tracks. The snow melted and the sand settled down in a hard, unyielding mass. Rotary snow plows and all the modern mechanical appliances for battling with snowdrifts were useless against this new enemy, and the railroad companies were compelled to engage men with picks and shovels to remove the sand from the track.

The work was begun while the gale was still in progress, and the suffering of the workmen is said to have been intense. The particles of sand, driven by a 60-mile an hour wind, cut through the clothes of the men and perforated their skin like knives. A few hours' work was all that a man could stand without seeking shelter from the blinding, suffocating storm of sand. On board the belated trains the condition of the travelers was not much better. Every door and window was kept closed to shut out the sand, yet it sifted in persistently until the floors of the cars were covered with it. The delayed passengers in several instances were compelled to go without food.

The New York Railroad Club.

This club held its regular monthly meeting April 18, in New York. The Chicago plan of car interchange received considerable discussion.

The Western Railway Club.

The latest meeting of this club was held at the Auditorium Hotel, Chicago, April 16. There was a discussion of Mr. C. A. Goodnow's paper on "The Train Staff System." There was also a topical discussion on the "Strength of Railway Car Axles." The main business of the meeting was a discussion on the M. C. B. Interchange Rules, and the new local interchange rules at Chicago.

Fast Run on the Pennsylvania Railroad.

The Pennsylvania Railroad line to Atlantic City had a record-breaking run, Sunday, April 21, made by the special newspaper train from Philadelphia to the popular seaside resort. The ferryboat to catch the train left the slip at Market street wharf, Philadelphia, at 5.30 A. M.: and 51¼ minutes afterwards the train stopped in the Atlantic City station. The train left the station in Camden 6¼ minutes after the departure from the Philadelphia side, so that the actual running time was only 45¾ minutes. The distance is 58.3 miles, and the average speed was 76½ miles an hour. This is the fastest time ever made between the Delaware and the Atlantic Ocean. From Winslow to Absecom, 24.9 miles, an average speed of 83 miles an hour was maintained. The fastest single mile was made in 41 seconds, which is an average of 87.8 miles an hour.

The Rock Island and the Rainmakers.

The Chicago, Rock Island & Pacific Railroad Company has apparently not lost confidence in the ultimate successful demonstration of the rainmaking theories of Clayton B. Jewell, who has been conducting experiments throughout the arid belt in the West for three years. Last year the company fitted up three cars with complete laboratories designed for coaxing moisture from the clouds. The campaign met with indifferent success and the repeated failures reported at the close of the season shook public confidence in the success of the venture. The Rock Island officers, however, appear to have faith in the theory, for they have ordered the construction of three additional cars at their shops in Holton, that will be put into service together with the three that were in commission last season, making a total of six.

The company has interested the Department of Agriculture at Washington in the enterprise to the extent that agents of the department will be sent out with the Kansas rainmaker this season to give the rainmaking method a thorough scientific investigation with a view to determining finally whether it is possessed of any actual merit.

Progress of the Transandine Line.

United States Minister Strobel, at Santiago, Chili, announces the settlement of an important question which has been pending for many months, namely, the rate of interest that the Chilian Government would guarantee to the Transandine Railway. In a report to the State Department he says that Congress on Feb. 9, passed a law which guarantees for 20 years to the railway company interest at the rate of 4½ per cent. on a capital of £1,300,000.

As work is being continued on the Argentine side, the hope is generally entertained in Chili that with the passage of the law, sufficient capital will be obtained for the completion of the entire road by both countries within a few years. The unfinished portion, however, comprises the most difficult portion of the road and will require almost continuous tunneling. The line on the Argentine side is finished as far as Punta de Vacas, and on the Chilian side as far as Salto del Salada. This leaves at present unfinished about 50 miles, almost equally divided between the two republics, this distance being at present traversed in 17 hours, and the whole trip from Valparaiso to Buenos Ayres occupying four days.

Apparatus for Registering the Speed of Locomotives.

This instrument is named by its inventors, Messrs. Pouget and Guillet, the chronotachyscope. Its action depends on the following two principles, viz.: (1) that the delivery from a given pump is proportional to the number of revolutions, and (2) that the flow of water through an orifice in the side of a vessel under constant pressure is proportional to the area of the orifice.

These principles are applied by connecting to any moving part of the locomotive a pump which takes water from a tank and delivers it into a cylinder in which is a weighted piston. This cylinder has a narrow slot of uniform width along one of its generating lines. The water escapes through this slot and returns to the reservoir. The position of the weighted piston indicates the velocity of the engine at any moment, since the flow from the pump is proportional to that velocity, and the piston will rise until the whole delivery from the pump can pass at the constant pressure. The movements of the piston are registered on a cylinder revolving by clockwork in the usual way.

It is claimed that with this apparatus every variation of speed is instantly recorded, while in other apparatus for the same purpose only the average velocity over a longer or shorter period is registered. It has been used for some time by the Paris, Lyons & Mediterranean Railway and found to be of considerable service. The pump used has three cylinders, and derives its motion from one of the engine truck wheels by means of a friction-roller kept in contact with the wheel by a spring.—*Le Genie Civil.*

The Toledo, Ann Arbor & North Michigan Railroad was sold, April 11th, to R. C. Martin, for the bondholders, for $290,000.

Locomotive Performances on Southern Pacific Railroad.

We are indebted to the courtesy of Mr. Henry J. Small, Superintendent of Motive Power and Machinery of the Southern Pacific Company, for the following very interesting information concerning recent locomotive performances on that road. The high cost of coal and the extensive hard work required of the locomotives on many parts of this road make the question of economical locomotive performanee one of greater importance than on any other large American railroad. In Mr. Small the Southern Pacific Company has a head to its mechanical department fully alive to the situation and zealous to meet its requirements; therefore, within the last few years, some of the most notable and trustworthy tests of simple and compound locomotives have been made on this road. Recently a number of new locomotives of the simple type were built for this road, and in our March issue we illustrated and described one of these engines, a 12-wheel freight engine with cylinders 22 inches by 26 inches, driving-wheels 51 inches in diameter, and boiler 72 inches in diameter. This was engine No. 2,010. A mate to this engine, No. 2,011, with identical dimensions, had already been delivered to the railroad and entered service Feb. 14. We repeat herewith the principal dimensions of these engines:

Weight of engine loaded	173,500	pounds
Weight on truck	27,000	"
Weight on drivers	146,500	"
Weight on drivers, per cent	84.44	"
Grate surface	34.58	sq. feet
Heating surface in firebox	184.26	"
Heating surface outside of tubes	2,170.52	"
Heating surface, total	2,354.78	"
Heating surface per square foot of grate	68 01	"
Heating surface per square inch of cyl. area	3.01	"
Cylinder area per square inch of flue opening	0.85	inches
Boiler pressure allowed	180	pounds

Size of steam ports, 1¼ inches by 18 inches. Size of exhaust ports, 3 inches by 18 inches. Exhaust nozzles, 5¾ inches diameter.

Diameter of cylinders	22	inches
Length of stroke	26	"
Diameter of drivers	51	"
Diameter of piston rod	4	"
Outside lap of valve	¾	"
Inside lap of valve	0	"
Lead of valves at full stroke	1/8	"
Area of exhaust nozzles	25.97	"

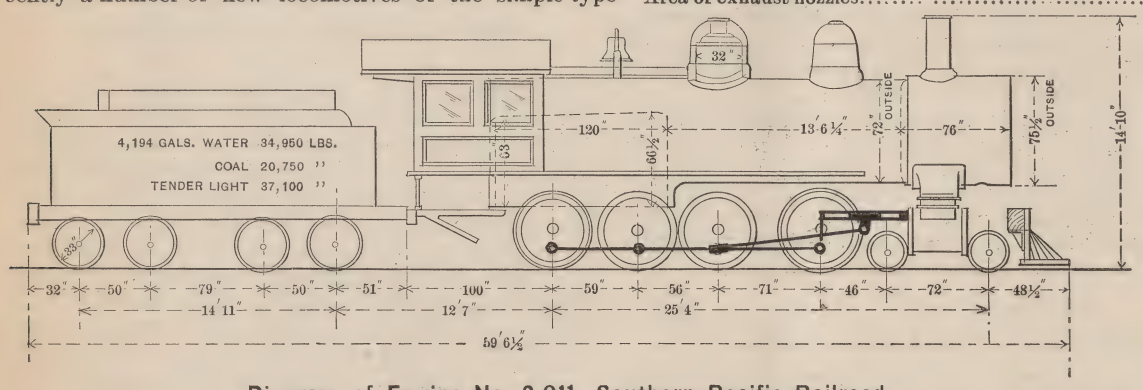
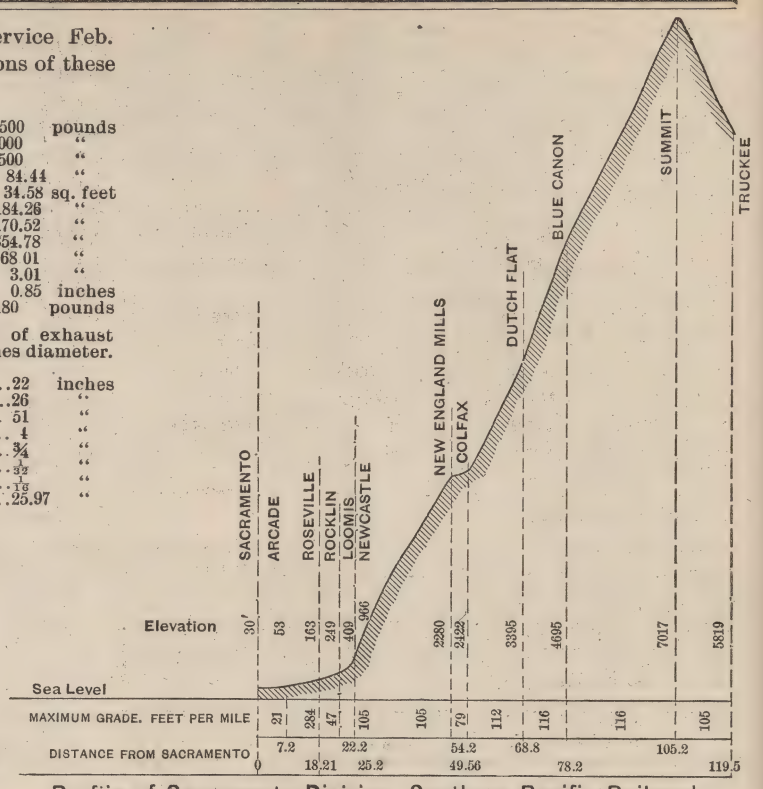


Diagram of Engine No. 2,011, Southern Pacific Railroad.



Profiie of Sacramento Division, Southern Pacific Railroad.
(Surmounting the Sierra Nevada Mountains.)

Some very carefully conducted tests were made of this and 10 other engines, on the Sacramento Division, a profile of which is shown herewith. Table 1 shows the condition of these tests and their results. Table 2 shows the results of tests of engine No. 2,011 for three round trips over this division in March. Table 3 compares the performance of this immense simple engine with the previous performances of a simple and a compound engine, respectively, with same size of drivers and on the same division.

We reproduce a series of indicator diagrams, taken from engine 2,011 on Feb. 25, while climbing the Sierra Nevada Mountain range with a freight train of two loaded box cars and 29 empty stock cars, weighing, exclusive of engine and tender, 402.5 tons. The profile engraving of the road

TABLE I.—HAULING CAPACITY OF LOCOMOTIVES, S. P. CO.

Office Superintendent M. P. and M., S. P. Co., Sacramento, March 4, 1895.

At speed of 12 miles per hour.

M. E. P. at 70 per cent. of boiler pressure. Adhesion 1/5 and 1/4 wt. on drivers. | Tractive power taken when not more than adhesion. Track and rolling stock in good ordinary condition.

Curves in degrees.	Maximum grade in feet per mile.	Number and type of engine.	1990. Schen 12-wheel. Compound.	2000. Schen. 12-wheel. Compound.	1955. Schen. 12-wheel Simple.	1910. S. P. Co. Consol'n. Simple.	1770. S. P. Co. 10-wheel Simple.	1750. Schen. 10-wheel Simple.	1800. Cooke 10-wheel Simple.	1787. Schen. 10-wheel Simple.	1790. Schen. 10-wheel Compound.	2011. Schen. 12-wheel Simple.	1819. Cooke 10-wheel. Simple.
		Dimensions of Cylinders	20″ + 29″ × 26″	20″ + 30″ × 26″	20″ × 26″	19″ × 30″	18″ × 30″	18″ × 24″	19″ × 24″	19″ × 24″	20″ + 29″ × 26″	22″ × 26″	20″ × 26″
		Diameter of drivers	51″	51″	51″	51″	57″	54″	63″	69″	69″	51″	63″
		Weight of engine loaded	140,800	141,000	133,000	114,850	105,100	106,200	130,750	127,000	132,150	173,500	142,350
		" of tender loaded, pounds	82.800	82,800	71,800	69,400	69,400	68,300	80,450	82,800	82,800	92,800	88,800
		Total weight of engine and tender loaded	223,600	223,800	204,800	184,250	174,500	174,500	211,200	209,800	214,950	266,300	231,150
		Weight on drivers, pounds	120,200	117,750	109,700	101,200	78,700	87,500	104,900	101,500	160,000	146,500	112,050
		Adhesion at 1/5 wt., pounds	24,040	23,550	21,940	20,240	15,740	17,500	20,980	20,300	20,000	29,300	22,410
		" at 1/4 wt., sanded rail	30,050	29,437	27,425	25,300	19,675	21,875	26,225	25,375	25,000	36,625	28,012
		Tractive power, pounds	23,058	23,277	22,839	22,297	17,308	16,128	15,403	15,821	17,043	31,090	20,800
		Boiler pressure, pounds	180	180	160	150	145	160	160	180	180	180	180
		Mean effective pressure, pounds	100 and 60	100 and 57	112	105	101.5	112	172	126	100 and 60	126	126
		BETWEEN WHAT POINTS. Adhesion at	POUNDS OF LOADED CARS EXCLUSIVE OF ENGINE AND TENDER.										
0	26	Sacramento to Rocklin 1/5	2,375,800	2,400,200	2,268,500	2,097,400	1,599,900	1,643,600	1,525,200	1,573,700	1,706,300	3,036,700	2,449,400
		" " " 1/4	2,375,800	2,400,200	2,369,900	2,329,300	1,776,600	1,643,600	1,525,200	1,573,700	1,706,300	3,238,500	2,449,400
10	105	Rocklin to Colfax 1/5	637,500	645,400	614,500	571,600	413,300	427,800	364,000	381,000	421,500	827,900	776,800
		" " " 1/4	637,500	645,400	643,100	648,400	471,800	427,800	364,000	381,000	421,500	894,700	776,800
10	116	Colfax to Summit 1/5	577,200	584,600	557,100	518,600	372,100	385,600	323,700	339,600	376,900	751,200	722,300
		" " " 1/4	577,200	584,600	589,300	590,100	426,600	385 600	323,700	339,600	376,900	813,400	722,300
10	105	Truckee to Summit 1/5	637,500	645,400	614,500	571,600	413,300	427,800	364,000	381,000	421,500	827,900	776,800
		" " " 1/4	637,500	645,400	648,100	648,400	471,800	427,800	364,000	381,000	421,500	894,700	776,800
10	116	Bakersfield to Los Angeles 1/5	577,200	584,600	557,100	518,600	372,100	385,600	323,700	339,600	376,900	751,200	722,300
		" " " 1/4	577,200	584,600	589,300	590,100	426,600	385,600	323,700	339,600	376.900	813,400	722,300

TABLE II.—RECORD OF PERFORMANCE ENG. 2011 C. P. MARCH, 1895.

Three Round Freight Trips Over Sacramento Division.

	Sacto. and Truckee (round trips). Carbon Hill and Castle Gate. Freight				Sacto. to Truckee (single trips). Carbon Hill and Castle Gate. Freight.			
Location of run								
Kind of coal used								
Kind of service								
Date of test	March 1 & 2.	March 4 & 5.	March 7 & 8.	Average.	March 1.	March 4.	March 7.	Average.
Distance, miles per trip	239	239	239	239	119.5	119.5	119.5	119.5
Number of cars in train	16½	15½	15	15⅔	16	14	15	15
Weight of train (tons per trip hauled)	403.96	412.11	401.4	405.82	400.48	418.85	393.18	404.17
Gallons of water evaporated	24,718	25,297	22,621	24,213	19,175	20,048	17,675	18,966
Pounds " "	205,987	210,809	188,509	201,768	159,792	167,067	147,292	158,150
Pounds of coal burned	33,828	34,545	30,448	32,940	26,100	27,588	23,631	25,773
Average steam pressure	174 lbs.	172 lbs.	173 lbs.	173 lbs.	174 lbs.	172 lbs.	174 lbs.	173 lbs.
Average temperature feed water	46°	47°	48°	47°	50°	50°	50°	50°
Number of stops made	48	29	28	35	21	15	15	17
Actual running time	18 hrs. 49 m.	17 hrs. 9 m	14 hrs. 28 m.	16 hrs. 49 m.	10 hrs. 33 m	10 hrs. 22 m.	7 hrs. 31 m.	9 hrs. 29 m.
Total car miles	3,944	3,705	3,585	3,744	1,912	1,673	1,793	1,673
Total ton miles	96,546	98,494	95,935	96,991	47,857	49,873	46,985	48,298
Pounds coal used per 100 car miles	857.817	932.515	849.317	879.861	1,365.063	1 649.014	1,317.959	1,540.526
Pounds " " " 100 ton "	35.038	35.073	31.738	33.962	54.537	55.317	50.295	53.362
Pounds water used per 100 car miles	5,224.106	5,688.342	5,257.272	5,393.548	8,354.186	9,993.025	8,210.885	9,458.830
Pounds " " " 100 ton "	213.381	213.945	196.458	208,187	333.766	335.221	313.338	327.643
Evaporation, lbs. water per lb. coal	6.09	6.10	6.19	6.13	6.12	6.06	6.23	6.14
Equivalent evaporation, from and at 212°	7.46	7.47	7.57	7.50	7.47	7.39	7.61	7.50
Miles per ton coal	14.13	13.20	15 68	14.51	9 16	8.66	10.11	9.27
Miles per 1,000 gallons water	9.67	9.45	10.56	9.67	6.23	5.96	6.76	6.30

TABLE III — COMPARISON OF ABOVE AVERAGES WITH CORRESPONDING AVERAGES OF PREVIOUS TESTS WITH SIMPLE AND COMPOUND ENGINES.

	Sacramento and Truckee.			Per cent. increased performance. Engine 2,011 over.		Sacramento to Truckee.			Per cent. increased performance. Engine 2,011 over	
Location of run										
Kind of engine	Simple.	Compound.	Simple.	375 S. P. Simple.	367 S. P. Compound.	Simple.	Compound.	Simple.	375 S. P. Simple.	367 S. P. Compound.
Number of engine	375 S. P.	367 S. P.	2,011 C. P.			375 S. P.	367 S. P.	2,011 C. P.		
Date of test	March 30 to July 23, 1891.	March 5 to Aug. 11, 1891.	March 1 to 8, 1895.			March 30 to July 22, 1891.	March 5 to Aug. 10, 1891.	March 1 to 7, 1895.		
Service	Freight.	Freight.	Freight.			Freight.	Freight.	Freight.		
Number of trips { Round	13	18	3			13	18	3		
Number of trips { Single										
Distance, miles per trip	239	239	239			119.5	119.5	119.5		
Number cars in train	11 5/16	10 17/18	15⅔	40.04	43.14	11⅔	10⅝	15	33.57	37.76
Weight of train, tons per trip	285.97	270.40	405.82	41.91	50.08	277.07	270.70	404.17	45.87	49.30
Total car miles per trip	2,675	2,616	3,744	39.97	43.12	1,342	1,305	1,673	24.66	28.20
Total ton miles per trip	68,347	64,626	96,991	41.91	50.08	33,109	32,348	48,298	45.88	49.31
Total coal used, pounds per trip	26,574	22,910	32,940	23.96	43.78	20,988	17,462	25,773	22.80	47.59
Total water used, pounds per trip	149,178	127,230	201,768	35.25	58.58	115,878	97,731	158,150	36.47	61.82
Kind of coal	Carb. Hill and Rocky Mt.	Carb. Hill and Rocky Mt.	Carb. Hill and Castle Gate.	Saving shown for No. 2,011, + or —.		Carb. Hill and Rocky Mt.	Carb. Hill and Rocky Mt.	Carb. Hill and Castle Gate.	Saving shown for No. 2,011, + or —.	
Pounds coal used per 100 car miles	993.429	875.868	879.861	+11.43	— .45	1,563.891	1,342.012	1,540.526	+ 1.49	—14.79
Pounds coal used per 100 ton miles	38 881	35.451	33.962	+12.65	+ 4.20	63.392	53.983	53.362	+15.79	+ 1.15
Pounds water used per 100 car miles	5,576.836	4,864.053	5,393.548	+ 3.28	—10.88	8,634.246	7,510.678	9,458.830	— 9 55	—25.94
Pounds water used per 100 ton miles	218.266	196 872	208.187	+ 4.61	— 5 75	349.986	302.119	327 643	+ 6.38	— 8 45
Pounds water evaporated per pound coal	5.614	5.553	6.13	+ 9.19	+10.39	5.52	5.60	6.14	+11.23	+ 9.64

shows the grade at the different places where the diagrams were taken, and these places are named beneath each diagram. The accompanying table gives the necessary data relative to the diagrams.

The tests with these engines were made under ordinary service conditions; no expert suggestions or advice were given during the trips. Matters concerning management of engines were left entirely to the crews, as the object was to get results as near as possible from regular service conditions.

The crew on the "big engine," No. 2,011, were taken from the extra list in regular turn. The engineer had had several years' experience in freight work on this mountain division and was thoroughly capable. The firemen were good average men, but neither of long mountain experience. Two firemen were employed, as the constant work on the long trip was deemed too heavy for one man. On other engines but one fireman is ordinarily used. The same crews were retained during the successive trips of each series of tests.

It was not desired to select coal for the tests. At Sacramento the coal was Carbon Hill, while on the mountain and at Truckee, Castle Gate was taken. It would have been better to have used one kind of coal, but Castle Gate from the Rocky Mountains is always used at Truckee, while Carbon Hill from the Puget Sound country is used at Sacramento, the haul over the Sierras of these coals being thus avoided. Trains for each trip were weighed in terminal yards on day trip was made, and only loaded cars were hauled.

As the tests were made with the big engine at or near her utmost hauling capacity, the minimum of economical performance was exceeded, though the gain to the transportation department by large excess in load hauled was an object most desired. The service on this division crossing the Sierra Nevada Mountains is severe and in many ways peculiar.

Starting east from Sacramento about 22 miles of valley road with light grades is passed, but from this point on the heavy work commences, and in 83 miles an elevation of over 7,000 feet is reached. There are but few tangents in this distance and one curve after another follows the contour of the Sierras from base to summit. About 40 miles of the distance passes through continuous snow sheds, affording a condition of rail that varies much with the season and often with the time of day.

It will be seen that the division is severe for trials of motive power, as there are few breathing spells on the eastbound trips from Sacramento to Truckee (single trips) in the tables. The steaming of engine No. 2011 was excellent, and at no time was there lack of required boiler pressure. Injectors were in almost constant use during the heaviest work of the engine, though as much favoring was done as good judgment would allow.

Reference has been made to the tests having been made at about the utmost capacity of the engine. From preliminary trials the weight of train to be hauled was placed at 400 tons. This weight of train in relation to performance of the engine in coal and water are best seen by reference to the eastbound or single trips, as shown in the tables, this being up-hill work all but the short run down from Summit to Truckee. On the first of these trips the weight of train was but about half a ton in excess of the limit, as shown. After striking the beginning of the heavy grade considerable trouble was had with a hot main pin on the left side. Several stops were made for this reason which were not down on the bill, and account for the extra number of stops made on this day. These stops had to be made sometimes on the heaviest grades with the train on reversed curves. When starting the train under these circumstances, as might be expected, the engine labored hard with considerable slipping of drivers. This slipping was attributed mostly to adverse conditions, and on the next trip east a train was taken weighing nearly 419 tons, as shown. The engine showed a tendency to slip with this train and a slightly open throttle required constant attention to prevent waste of steam and fuel.

On the third trip over the mountain, March 7, the train was about 25 tons lighter than on the previous trip, and a reference to the figures of this date will show the greater economy in performance. The tendency to slip was noticeable, but more easily controlled than previously with heavier trains. The working position of reverse lever was in 13 inches (half stroke) during steady work on grades each day with light throttle and constant use of sand.

The indicator cards shown were taken under ordinary working conditions. The position of throttle is stated as "very light." This can best be explained by reference to the fact of the stand pipe having double throttle valves, each with openings 4⅛ and 5 inches. The effect of a "light throttle" is therefore to supply more steam to the cylinders than is usual with such a throttle opening, and as stated before it was shown that with 174 lbs. steam and full throttle the engine could not do her heavy work without a tendency to slip the drivers. Less than a 13-inch cut-off was found to develop insufficient power.

DIMENSIONS OF ENGINES.

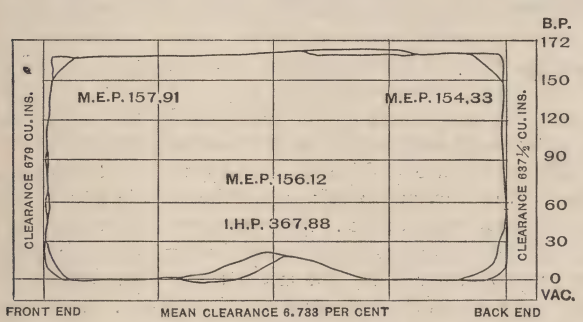
	375 S. P. simple.	367 S. P. compound.	2,011 C. P. simple.
Number			
Maker	Schenectady Loco. Works.	Schenectady Loco. Works.	Schenectady Loco. Works.
Size cylinders	20 × 26	20 and 29 × 26	22 × 26
Weight of engine on drivers	109,700	109,750	146,500
Weight of engine, total	133,000	139,000	173,500
Heating surface, square feet	1,884	1,884	2,354.78
Grate surface, square feet	30.82	30.82	34.58
Number wheels	12	12	12
Diameter of drivers	51 inch.	51-inch.	51-inch.

NOTE.—All train weights above are exclusive of engine and tender. Tests with engine 2,011 were made under ordinary service conditions except for careful measurements of coal and water taken and weight of trains hauled.

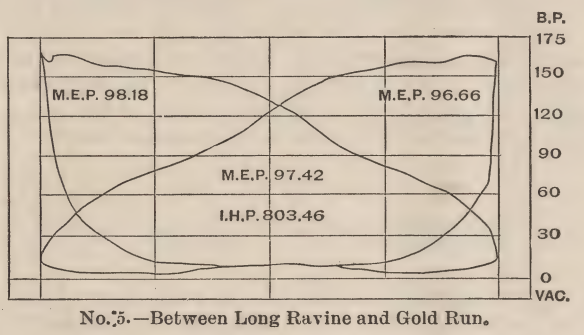
HOWARD STILLMAN, Engineer of Tests.

INDICATOR DIAGRAMS FROM ENGINE NO. 2,011.

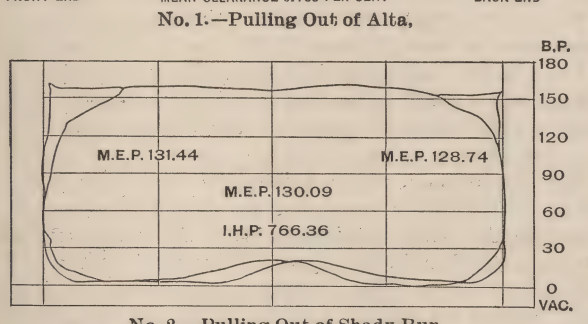
Number of card	1.	2.	3.	4.	5.	6.	7.	8.
Cut off at	23⅛ in.	22 in.	15 in.	15 in.	13 in.	10 in.	6 in.	6 in.
Revolutions per minute	24	60	48	60	84	152	140	148
Piston speed (feet per minute)	208	520	416	520	728	1,317	1,213	1,283
Velocity of train (miles per hour)	3.64	9.10	7.28	9.10	12.74	23.06	21.24	22.45
Position of throttle	Very light working throttle for all cards.							
Boiler pressure (pounds)	172	180	172	168	175	170	175	175
M. E. P. in cylinder (both ends)	156.12	130.09	126.30	122.87	97.42	48.66	40.36	41.19
I. H. P. of engine	367.88	766.36	595.22	723.82	803.46	726.19	554.77	598.53
Pounds steam used per H. P. per hour	32.633	31.989	23.988	24.352	22.529	15.82	18.33	17.746
Total tractive power of engine, pounds	37,888	31,568	30,649	29,816	23,641	11,808	9,794	9,995
M. E. P. on cross head, pounds	58,365	48,634	47,217	45,935	36,420	18,192	15,088	15,399



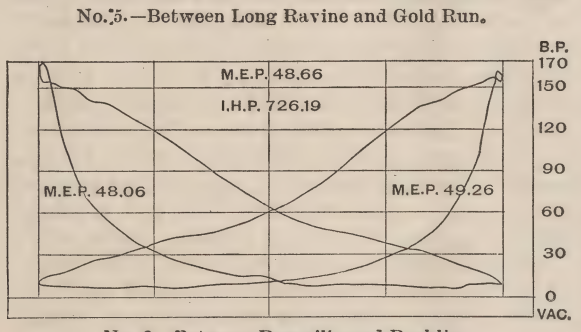
No. 1.—Pulling Out of Alta.



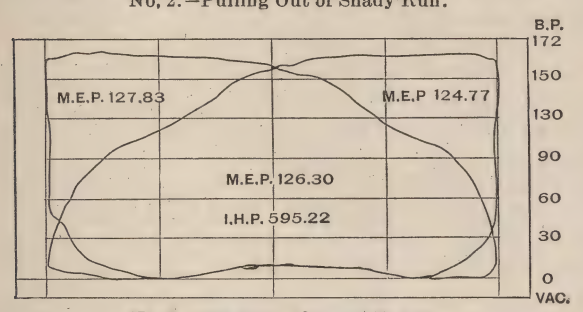
No. 5.—Between Long Ravine and Gold Run.



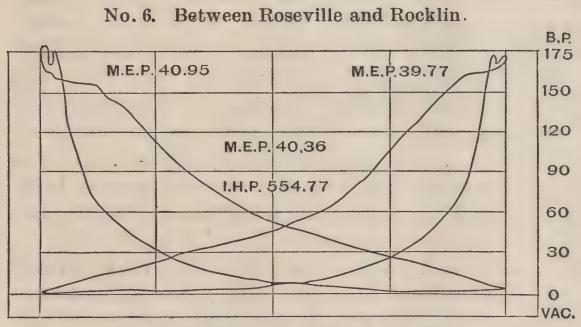
No. 2.—Pulling Out of Shady Run.



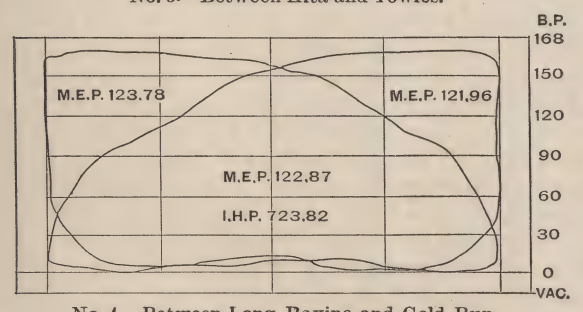
No. 6. Between Roseville and Rocklin.



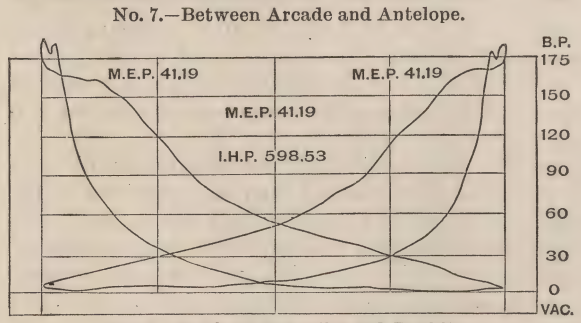
No. 3.—Between Alta and Towles.



No. 7.—Between Arcade and Antelope.



No. 4.—Between Long Ravine and Gold Run.



No. 8.—Between Roseville and Rocklin.

A Prosperous Street Railroad.

The report of the Metropolitan Street Railway Company, of New York, for the quarter ended Dec. 31 last, filed April 10, shows: Gross earnings from operation, $1,419,557; operating expenses, $811,538; net earnings from operation, $608,019; other income, $52,005; gross income, $660,025; fixed charges, $503,049; net income, $156,975; cash on hand, $73,498; profit and loss (surplus), $702,727.

New Car Construction

The revival in freight car building, says *The Timberman*, which has been predicted for this spring seems to have set in in full force. This is reflected in the NATIONAL CAR AND LOCOMOTIVE BUILDER, on one page of which we find recorded orders which have recently been, or are about to be, given for 9,100 freight cars; box, platform and tank. The largest order was one given in March by the New York Central for 3,000 box cars, but a good many others run well into the hundreds.

Among these others is one for 300 refrigerator cars to be built by a Chicago establishment, which is particularly worth mentioning. We have it from a private source that these cars are to be made entirely of Douglas fir and Washington spruce, except the bunkers, draw heads and brake beams. The object of this is said to be because of the lighter weight of the western material for an equal strength. These are private line cars to be used in the transcontinental trade, and it is stated that the railroad company in making rates on these cars specified this material because their heavy haul over the mountains made the weight of the cars an important consideration. It is possible, too, that the railroad company might have had in mind its freight earnings on the material in these cars, which must be hauled from the Pacific coast to Chicago. But at any rate the specifications on these cars are interesting as showing the strength of the new competition from the Pacific coast on material for this important class of work.

Willing to Die That Way.

Chauncey M. Depew has a new story, and he told every one who visited him at his office in the Grand Central Station about it the other day. On April 20 Mr. Depew made an address before the Montauk Club, in Brooklyn. Speaking of it, he said: "I had talked for fifty minutes. That is pretty long for an after-dinner speech, and looking at my watch I said to those seated around the table: 'I am talking you to death.' Quick as a flash from one of the seats came back the reply: 'That's the death we want to die.'

"Well," said Mr. Depew, "it was the neatest and prettiest compliment I ever received. It rather broke me up, but it added thirty minutes to the speech. From last accounts they were all alive."

Mr. M. B. Bulla, a telegraph operator in the employ of the Southern Pacific at Yuma, Ariz., has designed and patented a four-cylinder compound locomotive, having its frame on the outside of the drivers to give greater firebox width. The high-pressure cylinders connect with cranks on the outside of the drivers, and the low pressure with cranks formed in the driving axle inside the wheels. Connection between the main and rear drivers is obtained, when desired, by friction wheels placed between them raised into contact at will by steam power.

Locomotive Repair Shop Equipment.—II.

BY W. H. WESTON, M. E.

(*Continued from page* 52, NATIONAL CAR AND LOCOMOTIVE BUILDER *for April.*)

As to the machine tools necessary for a well equipped repair shop: One, even of moderate capacity, should have two driving wheel lathes, and these lathes should be heavy in all parts, this being a point of great importance if they are to be satisfactory in their work; as a light built driving wheel lathe, or one that is light in any of its parts, is one of the most unsatisfactory things to have about a shop, and it is of equal importance to have the lathe powerful throughout its movements. This cannot be too strongly impressed. It should always have two face-plates—that is, double-headed, each face-plate being double geared—such a lathe being capable of doing far more work than those made with only one face-plate. Care should be taken to avoid lathes on which the crank-pin hole boring attachment is awkward and unhandy, requiring an extra amount of time in its adjustment and also in its use. Lathes can be had on which this attachment is satisfactorily constructed, and there is no excuse for buying one on which it is not so, Too much care cannot be taken in having the bed and headstocks extra heavy and so formed as to take the strain through the lines of the greatest strength, and in having the spindles as large and the journals of as great an area as can be procured. A good foundation is required for each driving-wheel lathe. There is no place where there is any excuse for not having a stone foundation beneath this important tool, of ample size in area and depth, and if necessary, a set of piling under it. The stonework should never be of rubble, but should always be built of good stone, squared and dressed on beds and joints, and laid up in cement. Lime mortar is absolutely of no value in such work, and if the foundation is to be exposed to dampness, as often occurs, the cement must be hydraulic, used pure. If the lathe builders supply a reliable foundation plan it should be adhered to.

There is nothing that is more unsatisfactory about a shop than a poor hydraulic wheel press. A 300-ton press is none too large, and it should always be provided with two pumps of varying capacity to secure speed in use. These pumps should be preferably double-acting to secure a steadier and quicker action of the ram; it being of much importance to have the pumps so constructed that the valve will be directly accessible by simply unscrewing plugs at each one. The cylinder should be copper lined throughout, and ample arrangements for forming new ram packings should always be provided. In setting up care should be taken that there is belt power enough to keep the pump moving at the highest pressures, there often being a failure in this respect. The hoisting arrangements or crane should be more carefully planned than is often done, much time being lost by having to use clumsy and bungling hoisting gear. Putting the wheels into a press and setting them properly, and taking them out again, often uses more time than is used by the operation of the ram, and consequently the hoisting-gear cannot give too much speed and readiness of operation. Very often a crane operated by power is of advantage, this being either air or steam pressure. Another point of importance is to have the press located in such a place that there will be ample room for the movement of wheels to and from the press, and not situated, as is often the case, where there is little space around it, and if more than two or three pairs of wheels happen to be there at once the space is clogged. The same remarks apply to wheel lathes.

And here it may be said that every shop should be provided with a hydraulic press for forcing brasses into driving and truck boxes, thus saving much time and doing better work than the old sledge method. Such a press need not cost much to buy or to build, and will prove to be a very valuable tool and to give the most satisfactory results in use.

Some form of gas expander or its substitute should be used for tires.

In regard to a large vertical boring mill in a repair shop: There are a good many places that are not so equipped, but it is a great mistake to attempt to do the repairs without such a mill, for the reason that the driving wheel lathes usually have all they can do, and even if they don't, the turning of wheel centers and boring of tires is so much more readily done on a mill that it is money saved by making use of one. And again, there is always heavy work of one kind and another that can be done to advantage on this mill. Aside from this, the mill of medium size for truck wheel tires should always be provided. In the large and small mills, both speed and ease of movement in the adjustment of the parts are essential features. The cross-rail should be raised by power, and automatic feed provided in every movement of the cutting tool. The tool slides should have very large bearing surfaces, and should be capable of being set at any angle. The base castings and uprights cannot be too heavy and strongly formed, and the table spindle should be large and long and most carefully fitted to its socket. In setting up the large mill the necessity of a solid stone foundation is an important item and one should always be built.

Another thing in shop equipment is that very often the large planer and the horizontal boring machine are not supplied even in shops that repair a large number of engines. The want of these tools causes much disadvantage in doing the work, or excessive cost in having to have part of it done elsewhere. A planer large enough to take a cylinder, or cylinder and half saddle, and a boring machine large enough to take a cylinder, are as important as any other tools in a shop. In procuring such a planer care should be used to avoid getting the machines of light construction that are on the market, as these large planers will not stand up to their work unless they are heavily and powerfully built.

In regard to the milling machine, there is now no doubt but that it will supplant the work of the planer to a very great degree. In fact it has already done so in many places. Of course it will not drive the plainer out of use, but there is a large part of the work that can be done to better advantage on the milling machine, or a modification of the latter. It is not absolutely necessary to adhere strictly to the general form of this machine, but a style somewhat similar to that of the planer can be used in conjuction with the regular milling cutters for large and heavy work. Taking the common milling machine, as usually built, there is a large amount of the work in a repair shop that in many places is done on shapers and small planers, that can be done much better and more readily on it.

For a railroad shop, there is no necessity for the most complicated of machines fitted with all attachments. Plain milling machines being better suited to the work and much cheaper in first cost. The attachments should be for ordinary work: a vertical spindle attachment, a circular milling attachment, index centers, a swivel vise and a good supply of cutters and arbors and end mills.

Another tool of much importance in a railroad shop as well as in many others, is the screw machine. The value of this tool is not appreciated to the extent that it should be, and its introduction into many shops would bring about a great saving in the cost of doing much of the work. The making and finishing of studs, nuts, bushings, pins, etc., and the production of a large variety of articles from bar iron or steel, and the finishing up of small forgings, are the classes of work that the screw machine can be used for, and it will do such work at a very great reduction of cost over what it would cost to produce it in the lathe. The work turned out by the screw machine is far more uniform than can be had by the use of the lathe.

The Finest Railroad Paint Shop.

A very complete description of the paint shops of the Pennsylvania Railroad at Altoona was recently published in the Altoona *Tribune*, and we glean the substance of the following therefrom: As the painting of freight cars is a simple matter, so the sheds for this purpose are simple in construction. The main paint shop, where the passenger equipment cars receive their finishing touches, is quite an elaborate plant, and is situated at the extreme southern end of the yard. It was erected in 1889, and is 420 feet long and 135 feet broad, the prospects being that an extension of 60 feet in length will soon be added. It is divided into fireproof sections, these being separated by brick walls and iron doors. In the end nearest to Chestnut avenue, comprising a space of 80 × 155 feet, is the varnish room. Here all seats, sash, car furnitnre of every description, etc., pass through the hands of expert workmen, who apply the necessary number of coats of varnish to give the required finish, the work after passing their hands being stored in a very convenient and ingenious series of racks provided, the size of the storage spaces being changed as necessity requires by a system of movable pins, which allow of the shelves being placed close together, or far apart as desired. Along one end of this room extends a gallery about 12 feet in width, this constituting a separate working space, where are varnished beads, moldings, and other light trimmings which go to make up the interior finish of the cars. Underneath, and at one end of this gallery is situated the foreman's office, the sides of which are all of glass, and the interior arrangement perfection itself.

The room or section adjoining the varnish room is known as No. 3, they being numbered from the other end of the building. In this section there are six tracks, each track being 135 feet in length, and capable of accommodating two cars each, or 12 in all. Here new cars are painted from the woodwork up to the complete finish. First, the woodwork is thoroughly pummiced and all inequalities of surface removed; then the grain is treated to successive coats of filler and the rubbing-down process again gone through with until the foundation is as near perfect as it can be. Next the priming coats are given, and then, on successive days, the various coats of color and varnish until, when the entire course has been completed, 10 days have been consumed, each one witnessing a distinct operation, and the final result being about as complete a job of artistic car finish as it is possible to turn out, and the work being of the most durable character.

The next room, No. 2, contains 7 tracks, holding 14 cars, and here the same operations described in No. 3 are gone through with. No. 1 section at present contains 4 tracks, accommodating 8 cars, and its uses are the same as the two others described.

The floors throughout the building are of concrete, and the walls are painted white, so that with the light from the large double windows at either end of the track, supplemented by that from the double skylight over each track, the daylight illumination is of the very best. For night work there are throughout the different rooms 73 arc lights and 250 incandescent lamps, the former being suspended from the center of the skylights immediately over the cars standing upon the tracks, so that the light shines directly upon the side of the car on the tracks adjoining, while the incandescent lights are so arranged that they can be raised or lowered and taken at will on the inside of cars, thus placing the light where needed at all times.

On either side of each track there is a depression in the cement floor, forming a gutter, these being covered with gratings, and carrying away to the sewer all water used in washing down the sides of cars. Underneath each track there is a tunnel running from front to rear of the building. Another tunnel runs from end to end of the entire structure. These tunnels are all connected by iron gratings, and through these all smell of paint, oil and varnish is drawn to the ovens in the engine-house, where they are dissipated, thus keeping the atmosphere of the shop almost as pure as a parlor.

Throughout the different rooms there are iron boxes placed at convenient intervals, and into these are thrown all waste and dirt of every kind, rendering the keeping clean of all parts an easy matter. Connected with each room there is a toilet room, as comfortably and neatly arranged as any to be found in a modern private residence or costly public building.

The Sturtevant system of heating is used, and most excellent results are attained in this way. In the engine room are located two Sturtevant engines and two fans. These are connected to a large iron oven, at one side of which is a mass of radiating steam pipes. Cold air being constantly supplied to this oven in winter time and passing over the radiating pipes, it is quickly heated and forced into four-feet mains leading to the different departments of the paint shop. From these large mains others about 18 inches in diameter branch off, and these in turn supply the smaller ones, which permeate every portion of the building, keeping it at a regular temperature in all kinds of weather. In summer time, with the steam shut off, these same fans supply a cold blast, and by this means the shops are kept comfortable in the hottest weather.

Another feature of this shop is the system of scaffolding from which the men work upon the outside of the cars standing upon the tracks. Between each two tracks there is a line of upright posts, having fixed in them arms extending to either side, and upon these arms planks are laid, upon which the men stand or sit to work. There are a number of grooves or mortises in these posts, so that the arms can be placed close to the floor or at a height of 7 feet 6 inches, but otherwise the system is always in place and always ready when needed. At the side-walls are similar posts and arms, save that the arms extend in but one direction.

The engine room, which adjoins the paint shop, is most substantially built of brick and is a model of neatness and convenience. Here, in addition to the Sturtevant engines, fans, oven and radiating pipes already mentioned, are two engines of 50 horse power each, two dynamos which furnish current for the arc electric lights, one dynamo for the incandescent lights, and one electrical generator which furnishes current for the transfer table.

The transfer pit parallels the paint shop. Its length is 420 feet, and the table to traverse that distance requires just one minute and a half. A car is brought to the table by a track which ends at the Chestnut avenue end of the building, the transfer table is run to it, the car placed upon the table, and then the table moves off to the shop entrance desired, where it is stopped. The car is then run into the building and is ready for the men to go to work on it.

Near the eastern end of the paint shop is the stock room. This building is about 50 by 25 feet in size. Within its walls are kept a large supply of paints, varnishes, oils, glass, etc., all arranged in the most convenient manner, both on the main floor and in the cellar, which is under the building. In addition to the shelves for the various goods, there are closed cupboards in which are kept the brushes, etc., when not in use. Here all the paints and varnishes are mixed and given out each day, as well as all brushes and other tools necessary in prosecuting the work. A check system is in use here in this connection, and has been found to work more satisfactorily than any other yet tried. There are a number of boxes representing each gang at work in the shops and tin checks to designate the different articles in use, such as paint, varnish, bucket, brush, and so on. When any member of a gang draws any one of these supplies a check corresponding to the article is placed in that gang's bin, and as all unused supplies are required to be returned at the close of each day's work, if the checks are not all taken out it is an easy matter to tell who has failed to make a proper return. Under the system where the workman carries the checks these are liable to be lost, but here the stockkeeper knows at all times where the check is located and pretty nearly who is responsible for any missing article. In this building there is a small compound engine, which operates an elevator runnning between the cellar and first floor, and also grinds colors as needed in the shop. All paints are mixed here before given out, and this work being in the hands of a few men only, and they

having acquired dexterity by long experience, the standards are easily maintained.

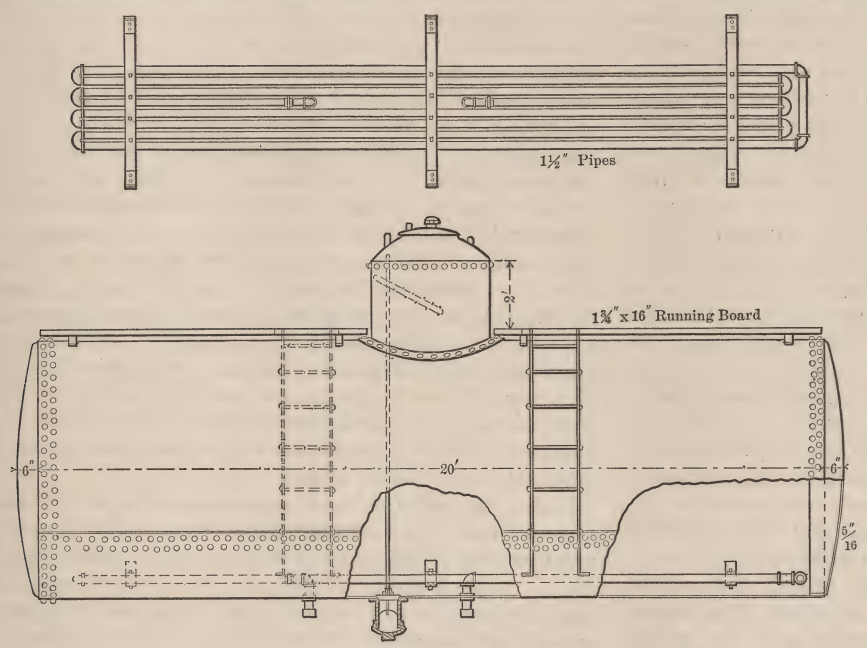
Hot and and cold water is furnished throughout these buildings, troughs and faucets being placed at convenient intervals. Only one faucet is used at each place, however, the heat being furnished from a steam pipe which joins it. This steam comes from the engine and dynamo room, but it is first brought there in a six-inch pipe from the planing mill steam plant 1,000 feet away.

The paint shop, if run to its fullest capacity, can turn out 40 new passenger cars per month. For repairs the shop averaged last winter 90 cars per month. In the freight paint shop about 30 cars per day, including box and gondola cars, are turned out fully painted.

A Molasses Tank Car.

In our April issue we published a description and reproduced a photograph of a tank car for hauling molasses built for the Goyer Tank Line by the Memphis Car and Foundry Company. Since then we have been supplied with drawings showing the construction of the tank, and the arrangement of steam pipes placed in the bottom thereof for warming the molasses so as to cause it to flow freely in unloading. We reproduce these drawings in the accompanying engraving.

These cars carry 5,000 gallons of syrup, which is equivalent to a load of 60,000 pounds. The dome is large enough to admit a man, and the tanks are thoroughly washed after each trip. The steam pipes are galvanized, and the outlet for the syrup at the bottom of the tank is six inches in diameter.



Tank of Car for the Transportation of Molasses.

Many advantages follow this method of transporting syrups compared with the previous way of using barrels. The barrels absorb about 45 pounds of syrup each in their staves, and the expense in handling is, of course, very much less with such cars as these.

A Railroad Built Under Difficulties.

The claim of Japan to the Island of Formosa as a part of the indemnity for its successful war against China recalls some incidents of railroad building on the Island, that in the end proved unsuccessful owing to the prejudice of the inhabitants. Tai-peh-foo, the capital of Formosa, has a population of over 200,000. During the French war it was the headquarters of General Liu Ming Shang, one of the few heroic characters in that conflict. Though ignorant and superstitious, he had a broad intelligence, and, rarest of all in a mandarin, he had a high regard for Western science. Finding that the drinking water was very impure, he engaged foreign engineers and sunk artesian wells, which provided an inexhaustible supply of pure water. They are carefully walled and protected, and pour out an everflowing stream. He constructed a railway from Ketung to Tai-peh-foo, thence to Ban-ka, and thence southward to the middle of the island. It was his intention to extend it to Tai-wan-foo and Takow, the southern treaty ports, and thence to the South Cape. But Chinese conservatism and superstition were too much for even this brave old soldier. The building of the road dragged and, finally, came to a standstill, and then he was transferred to a province in North China.

When this road was begun the mob stoned the laborers and swore it should not be built. The Governor issued a proclamation that it should, and to prove his words chopped off a dozen mutinous heads. The tracklaying then went smoothly on. Before long the populace began to misappropriate ties, spikes, plates, bolts and frogs. Again a few heads were lopped and a proclamation issued making the householders living along the line of the road responsible for its integrity. The stealing stopped as if by magic. The road was finished, rolling stock put on and locomotion begun. All went well for several months, when some Celestial heard that in the foreign-devil country whenever a foreigh-devil steam wagon ran over a man it had to pay him or his heirs. The news spread, and an old man, with characteristic Chinese ideas, said good-by to his family and went out and lay upon the track until a train came and put an end to his career. The family the next day waited upon the Governor and, with loud lamentations, quoted the law and demanded damages for the death of their ancestor. The official consulted his foreign engineers, who confirmed the statement, and then paid over $250 as an indemnity. Within two days an old woman was run over and killed; within a week seven aged persons met the same voluntary death, although the compensation had been reduced to $100. The Governor became enraged and issued a unique proclamation. He made it a felony to commit suicide on or about a railway, or to be found near a railway with suicidal intent. He ordered all such suicides to be buried as common criminals, prohibited the asking or receiving of damages and made it a misdemeanor punishable by fine and imprisonment for any and all members of a family to permit any of their number to commit suicide on a railroad. After this there was no more *felo de se* activity.

A daily standard Pullman sleeping car service has been inaugurated between Chicago and Fort Worth via Chicago & Alton, St. Louis, Iron Mountain & Southern and Texas & Pacific railways, leaving Chicago at 11 A. M. and reaching Fort Worth at 11.30 next night.

Southern Industrial Prospects.

Mr. Samuel Spencer, President of the Southern Railway Company, lately made an extended tour in the South, and has this to say of railway, crop and manufacturing conditions in the Southern States :

"Conditions in the South are improving, although the earnings of the Southern railways are a little less this spring than last—a consequence largely, if not entirely, of the fact that the spring business is that represented by the use of money which comes from crops, and the low price of cotton and the destruction of fruit and vegetable crops by cold have diminished the relative amount of this money. The fertilizing business is also much smaller—not more than 60 or 65 per cent. of a normal year. The South is turning its attention more and more to manufacturing and agricultural products other than cotton. The result is more independence for the Southern farmer and a larger investment of capital at home, as well as a greater influx of foreign capital.

"The physical condition of the Southern Railway is better than it ever was. The business of the system for March was better than for February and January. The falling off in February was largely due to the exceptional weather through the South. The finances of the company are simplicity itself. It does not owe anything, and is earning more than its fixed charges."

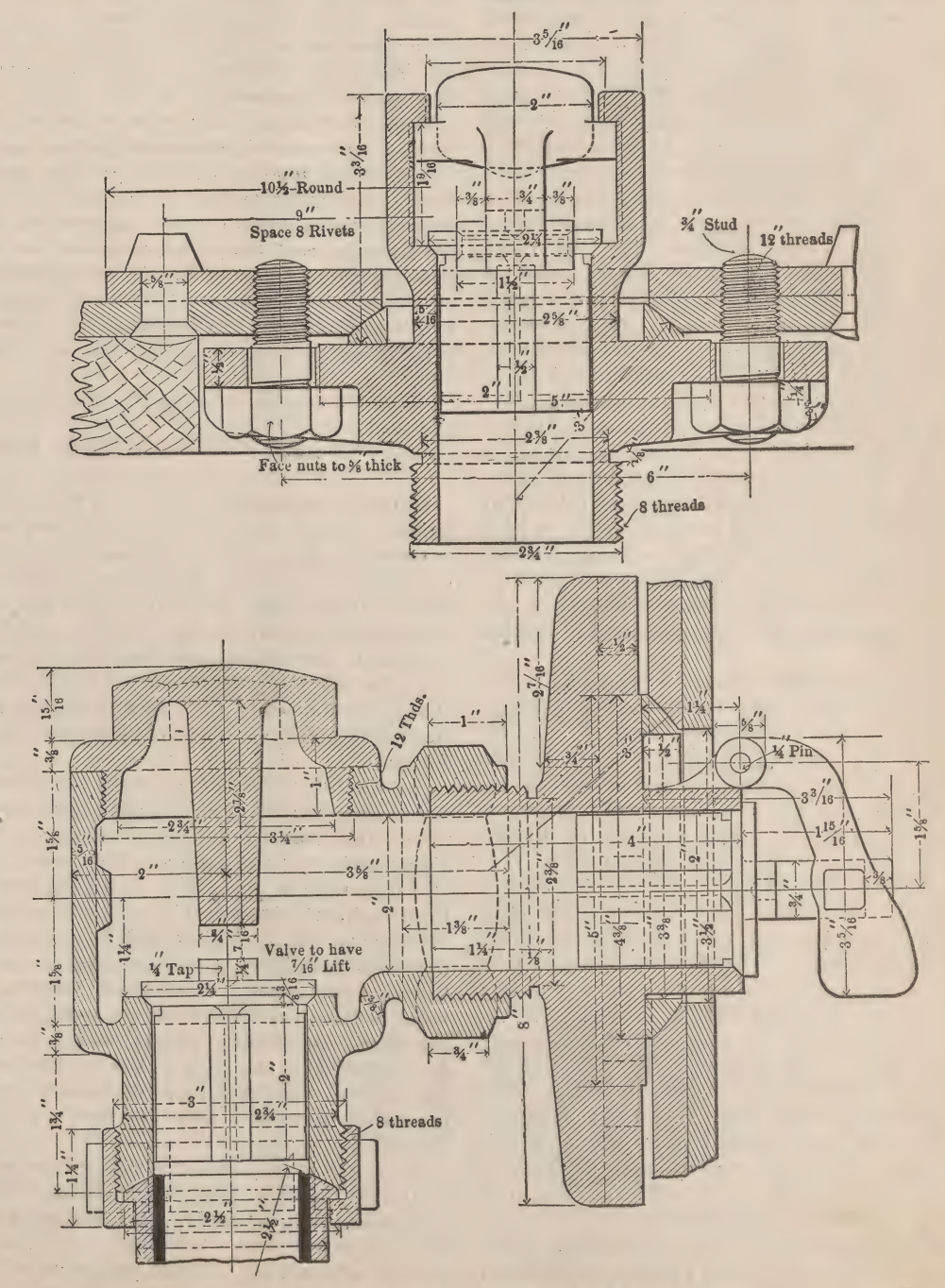
A San Francisco jury in the case of the strikers charged with obstructing the mails during the recent railroad strike, was discharged by United States District Judge Morrow, April 5, being unable to reach an agreement. They stood ten for conviction and two for acquittal, after being out four days.

Improved Boiler Check, Baltimore & Ohio Railroad.

About a year ago the mechanical department of the Baltimore & Ohio adopted the improved form of check shown in our engravings. The intention being to provide a safety check within the boiler and to dispense with the horizontal line check in the delivery pipe. The arrangement has proved very satisfactory and convenient for repairs.

The outer valve having a vertical lift closes promptly when the inward flow of water ceases. Being a separate body it can be got at and easily reground by simply moving the cap above it, and if necessary this can be done with the boiler under steam, or the check body can be removed bodily and the inner valve reground without removing the flange. This valve is horizontal, and to make it close promptly a pendent weight is fulcrumed above it, its tendency to assume a perpendicular position causing it to press the valve lightly towards its seat.

To prevent the inner valve from lifting too much or dropping into the boiler, two inward projections from the flange limit the inward motion of the weight and the valve.



Improved Boiler Check, Baltimore & Ohio Railroad.

NATIONAL CAR LOCOMOTIVE BUILDER

ESTABLISHED IN 1870.

PUBLISHED MONTHLY

BY

R. M. VAN ARSDALE,

MORSE BUILDING.....NEW YORK

GEORGE H. BAKER, Editor.

HERBERT W. POOL, Business Manager.

MAY, 1895.

Subscription.—*$2.00 a year for the United States and Canada; $2.50 a year to Foreign Countries embraced in the Universal Postal Union.*

EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING PAGES. *The reading pages will contain only such matter as we consider of interest to our readers.*

Special Notice.—*As the* NATIONAL CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, correspondence, advertisements, etc., intended for insertion must be received not later than the 25th day of each month.*

Contributions.—*Articles relating to railway rolling stock construction and management and kindred topics, by those who are practically acquainted with these subjects, are specially desired. Also early notices of official changes, and additions of new equipment for the road or the shop, by purchase or construction.*

To Subscribers.—*The* NATIONAL CAR AND LOCOMOTIVE BUILDER *is mailed regularly to every subscriber each month. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery, and in case the paper is not then obtained this office should be notified, so that the missing paper may be supplied.* **When a subscriber changes his address** *he ought to notify this office at once, so that the paper may be sent to the proper destination.*

A SIMPLE ENGINE'S NOTABLE PERFORMANCE.

Those interested in the comparative economy of simple and compound locomotives will find some very interesting information in the quite complete report we publish on pages 68 and 69 of this issue of tests made of an exceedingly large, simple locomotive on the Southern Pacific road in March, the results of which are compared in tabulated form with the results of previous tests of large compound and simple engines on the same division of the same road, in the same service, and practically in the same season of the year. The results obtained are largely in favor of the new and larger simple engine, and the cause seems to lie chiefly in the much larger boiler of the same, affording greater heating surface and grate area, and more water and steam room. Compared with a simple engine and a compound engine of like dimentions, the new simple engine has the same number and diameter of driving wheels, 3.76 square feet more grate surface and 470.78 square feet more heating surface, and 2 inches greater diameter of cylinders. The increased diameter of cylinders, however, does not seem to have benefited the engine as much with the same size of drivers used (51 inches) as if somewhat larger drivers had been used; for even with an increased weight of 34,500 pounds, the adhesion was not sufficient to enable the power of the larger cylinders to be utilized, as was proved by the excessive slipping of the drivers during the heaviest work the engine was capable of performing.

A careful study of the tables presented in our report will reveal a good deal of interesting and instructive information. Therein is compared the performance of this new simple engine having cylinders 22 inches by 26 inches and 51-inch drivers, with the performances of compound engines with 20 and 29 by 26-inch cylinders, and 20 and 30 by 26-inch cylinders, and the same diameter of drivers; and with the performances of simple engines having cylinders 20 by 26-inches and 19 by 30 inches with 51-inch drivers, 18 by 30-inch cylinders with 57-inch drivers, 18 by 24-inch cylinders with 54-inch drivers, 19 by 24-inch cylinders with 63-inch drivers, 19 by 34-inch cylinders with 69-inch drivers, and again with a compound engine with 20 and 29 by 26-inch cylinders with 69-inch drivers. As these comparisons are side by side in a table they may be easily studied, and will doubtless furnish those of our readers who are students of the influences that affect locomotive economy considerable "food for thought." Compared with the performances of a simple and a compound engine with same number and diameter of drivers, same steam pressure, and with no other material difference except the increased size of boiler and cylinders mentioned above, this large new engine hauled over 40 per cent. greater train load; and burned 12.65 per cent. less coal than the simple engine, and 4.22 per cent. less coal than the compound engine, figured on the basis of pounds of coal used per hundred-ton-miles.

A study of the action of the new engine during its hardest work, naturally leads to the conclusion that this excellent performance could have been surpassed with larger driving wheels, as the cylinder power was evidently amply sufficient for larger drivers, and with a few inches increased diameter of these, several thousand less cylinder-fulls of steam would be required per hundred miles run.

COMFORT IN CABS.

The question of cabs for locomotives is being agitated in England, where, as is well known, the nearest approach to a decent cab on a locomotive is in most cases a wretched excuse. A recent collision was caused by the engineer and fireman trying to obtain shelter while backing up on a bitterly cold night. It has been found also that improvements in cabs reduce the amount of sickness among the enginemen in bad weather, while "on some lines upon which the engines have little or no protection, men have been ill and off duty to such an extent as to cause considerable inconvenience in arranging for men to work the trains."

The opinion has prevailed in England that a comfortable cab on an engine would tend to make the engineer and fireman careless and neglectful of their work. This is coming to be recognized there, as it has always been regarded here, as sheer nonsense. We have good cabs on American engines, and no fault has ever been found with them, unless they were not good enough. The best practice endeavors to make them roomy and commodious, tight and warm for winter, and capable of being made airy and well ventilated for summer, ventilators being frequently put in the roof to accomplish the latter purpose. This is so generally regarded as the best practice that it hardly needs mention here, except as leading up to a point about which there is some divergence of opinion. It is: should cabs be made as comfortable as possible? Until lately, we believe, the general sentiment has been that they could not be made too comfortable, and many railroads have gone to considerable expense to equip cabs with seat, back and armrest cushions, while all roads have at least allowed the enginemen practically a free hand in furnishing such comforts themselves. Some of the roads now, however, are placing restrictions on these privileges, and others are ceasing to supply and keep in repair cab cushions.

The desire to economize in repairs is entirely laudable, but excessive economy always results in loss. It is possible that very strict economy in this direction is not wisely directed. It should be borne in mind that the men who run and fire locomotives can by the exercise or non-exercise of zeal in the performance of their work materially affect the cost of operating the engines. A neat, comfortable engine exerts a good influence on these men and they are generally appreciative of comforts or conveniences provided for them. Their work is generally (and in bad weather particularly) arduous and trying, and we are sure it is a mistaken policy that prompts the removal of any possible comfort from their reach. The loss of such, when once enjoyed, is apt to prove discouraging and result in the lessening zeal that will increase the cost of operation. Conveniences and comforts in the cabs promote good work by increasing the interest of the men in the engines, and by lessening the exhaustion consequent from their work, thereby leaving more energy for the proper performance of it.

CHIME WHISTLES ON PASSENGER ENGINES.

It is being announced by some of the technical papers that the Pennsylvania Railroad has adopted chime whistles as standard for its passenger engines. The fact is that this road has been equipping its passenger engines with chime whistles for the past two years, and is now pushing such equipment as rapidly as possible. This is not only complimentary to the good sense of the Pennsylvania's management, but it is also a healthy sign of the increased attention that is being given by railroad managers to what we have frequently spoken of as the refinements of railroad management.

The most successful managers of large retail establishments vie with each other in adopting refinements of their service that eliminate every possible phase of trade that is disagreeable to their patrons. The same policy should prevail in railroad operating. Railroads have transportation to sell, and much of it is retailed to individual passengers who are apt to bestow their future patronage where the results promise to be most pleasant; or, at least, where there is a minimum of disagreeable features. The squalling, bellowing, screeching whistles used on many passenger engines are properly classed among the latter. Their rasping tones are annoying in the day time and exasperating at night, when they frequently startle sleeping passengers, or entirely chase away the gentle god vainly being wooed.

The action of such roads as the Pennsylvania and Michigan Central in recognizing these facts, and adopting whistles with sost, pleasant tones for their passenger engines, will surely have the effect of prompting other roads to do likewise or of drawing a larger proportion of patronage to themselves.

ECONOMY OF IMPROVED TOOLS.

The interesting series of articles being contributed at present to the NATIONAL CAR AND LOCOMOTIVE BUILDER by Mr. W. H. Weston, on "Locomotive Repair Shop Equipment," will prove of interest and value to those who make and those who use improved tools for railroad shops. The "penny wise pound foolish" policy of some railroads in dealing with this matter is responsible for a much higher average cost of repairs and renewals than is frequently necessary.

A few hundred dollars "saved" in the purchase of an inferior instead of a superior tool, or "saved" by continuing in use antiquated tools instead of procuring improved ones capable of doing the required work in half the time and with half the labor, really results in the actual loss of many thousands of dollars through the increased cost of the work when done with the old tools over what would be the cost with the new improved machinery. If Mr. Weston's articles succeed in impressing these facts on some people who need to be so impressed, they will accomplish their purpose.

THE FUEL AND WATER SUPPLY OF RAILROADS.

The question of who should have charge of the fuel and water supply of railroads is to be considered by the Traveling Engineers' Association at its next meeting, and we publish on page 75 of this issue the circular of inquiry issued by the committee having the subject in hand. This is a matter that has not received in the past the consideration due to its importance, in fact very little attention has been given it. The custom of leaving the matter of water supply in the hands of the road department has been handed down from the early days of railroading, and the matter of fuel supply has always generally been considered as belonging properly to the purchasing department. It is an open question if either of these customs is the best arrangement that can be made, or if either produces the most satisfactory results attainable. Both of these supplies are for the almost exclusive use of locomotives, and if in the arrangements for their provision the needs of the engines are in any way neglected considerable financial loss is sure to result.

It does not require much consideration to decide that those who are practically ignorant of locomotive requirements cannot properly appreciate them or administer to them. It is quite as evident that the arrangements for these two most important locomotive supplies should be made either in accordance with the instructions or the advice of the officers responsible for the economical operation and maintenance of the locomotives.

OPEN THROTTLES IN COLLISIONS.

It is one of the curiosities of newspaper making that the daily papers are always trying to instruct their readers how railroads should be operated. Perhaps this in itself is not so curious as the fact that the writers who are burdened with or take upon themselves the task are absolutely ignorant of the conditions involved, and generally succeed in making a painful display of such ignorance. When they stumble onto some theme which involves the mechanics of railroading they are particularly happy and loquacious, and equally stupid.

It is well known that after colliding with an obstruction abandoned locomotives sometimes run away in the opposite direction. The conditions must be that the engine has no train, that it was abandoned by its crew before the moment of collision with the reverse-lever in reverse position, and the throttle open. A recent instance of this character gave one of these "leaders of thought" a chance to air his talent in the following strain:

"The incident presents for the solution of practical railway men and for the contemplation of all railway passengers a difficult problem, or rather a series of difficult problems. Shall an engineer who sees that a collision is inevitable, having done all that he can to mitigate its first effects, obey the first law of nature and save himself by jumping? Or, must he still stick to his post? Has he any secondary obligation, based upon the chance of his train and engine and himself surviving the shock, to his own train load of passengers or to some other passenger train into which his own reversed freight train might dash? A yet more profitable question might be, is there not possible the addition to all engines of some automatic device whereby the reversal of its lever could be limited to about the time which it requires to bring an ordinary train, when unopposed by obstructions, to a standstill?"

Of course, this is all nonsense. Enginemen are not expected to stay on a colliding engine and sacrifice or run any great risk of sacrificing their lives, if escape is possible. Too many engineers, however, in such an emergency, "lose their head," and abandon the engine after reversing and "plugging" it without closing the throttle. The possible consequences of this forgetfulness in case of collision with cars containing passengers are terrible indeed; either the cylinder heads or steam pipes in the smokebox are liable to get broken and deluge the passengers with the scalding steam, or if these parts are not broken and other conditions are favorable, the engine is liable to recoil after the collision and with its open throttle run away in the opposite direction to deal destruction to

anything in its path. Instances of either kind are not at all infrequent, and possibly some instructions to engineers covering these points might not be amiss.

Every year now it is said that Chicagoans are going to have an actual railroad collision to order for their entertainment. The announcement is out again this year as usual. Possibly such a spectacle might prove profitable to its promoters, but would-be spectators should be warned that there is danger of one or more boiler explosions in colliding locomotives, and that such explosions sometimes occur, being caused by a rupture in a boiler that permits a sudden escape of considerable steam which results in an abnormally sudden generation of steam that rends the boiler and hurls pieces of it to great distances.

One of our English contemporaries announces that a movement is on foot there to introduce stenographers with typewriting machines on the corridor trains running between England and Scotland to further enhance the conveniences of these trains. It would seem that if such a plan is feasible it might add a useful feature to the through trains between far distant cities in this country, as between New York and Chicago, and Chicago and San Francisco. Some of these trains are now provided with nearly every other imaginable convenience, and we do not see why typewriters would not prove a more desirable convenience and help to busy men on these trains than barbers. The time spent by business men on these trips is now counted as lost, although they may have much important correspondence waiting to be attended to at the end of their journey. If this could be attended to on the train it certainly would prove in many cases an important help and means of saving time.

Literature.

Sketches of Wonderland, by Olin D. Wheeler. Illustrated. Pages 108. Price, six cents in stamps. Charles S. Fee, General Passenger and Ticket Agent Northern Pacific Railroad, St. Paul, Minn.

The above mentioned book is descriptive of the scenery and natural wonders along the route of the Northern Pacific Railroad It is aptly named "Sketches of Wonderland," as perhaps in no place on earth is more beautiful scenery to be found, or grander natural wonders. Among these is the famous Yellowstone National Park, the Rocky and Cascade Mountains, to the latter of which belongs the famous and beautiful Mount Rainier. This book is very handsomely bound, and the type and engravings are of the best quality. Those who enjoy tales of thrilling adventure and pictures and descriptions of wonderfully grand and beautiful scenery should obtain one of these books.

Record of the Field Transportation Commission Expedition, Harper's Weekly.

The series of special articles and photographs emanating from the Transportation Commission of the Field Columbian Museum in its tour around the world, which have been appearing in *Harper's Weekly*, have furnished a most interesting record of the expedition up to date. No pains have been spared in increasing their interest to the general public as well as to the professional reader. All the illustrations have been accompanied by full information as to the progress and proceedings of the Commission, together with such comments as have enabled the readers to follow the course taken, and to understand the results arrived at.

These articles are of additional value because no other medium of information can be available before the publication of an official report, which cannot reach the public for several years. At present the articles relate largely to Ceylon, to which special attention seems to have been given. Ceylon railways, railway stations, native methods of transportation, etc., are being treated most fully and interestingly. Nearly every week *Harper's Weekly* contains a fresh instalment of this matter.

The American Railway Association.

The spring meeting of this association was held in St. Louis April 17 and 18, with a large attendance. The membership now comprises 220 companies, operating 147,000 miles, equivalent to nearly 82 per cent. of the total mileage of the United States.

The Committee on Standard Track and Wheel Gages reported progress, and consideration of the subject was deferred until after the experiments now being made on the Pennsylvania Railroad are concluded. The committee conducting these is composed of three delegates from the American Railway Association, three from the Master Car Builders' Association and three from the Roadmasters' Association.

The Inter-Ocean Electric Railway Company proposes to build an elevated railroad between New York and Chicago for the electric transportation of freight. The company claims a capital stock of $200,000,000, and has been incorporated in Illinois. It proposes to eventually extend its elevated electric railroad to San Francisco. One of the incorporators says: "By elevating our road we expect to do away with the necessity of buying a right of way, and all delays incident to surface traffic will be avoided. At present it takes six days for freight to travel from Chicago to New York. On the new road the trip will take one. Building operations will begin soon."

The International Railway Congress.

This Congress will meet in London on June 26. Its last meeting was held in St. Petersburg, in 1892. The American Railway Association, which is a member of the Congress, will be represented by:

Henry S. Haines, President American Railway Association and Vice-President Plant system.
E. B. Thomas, First Vice-President American Railway Association and President New York Lake Erie & Western Railroad Company.
W. F. Allen, Secretary American Railway Association.
James T. Harahan, Second Vice-President Illinois Central Railroad Company.
Charles W. Bradley, General Superintendent West Shore Railroad.
Jacob J. Frey, General Manager Atchison, Topeka & Santa Fe Railroad.
Joseph Ramsey, Jr., General Manager Terminal Railroad Association of St. Louis, Mo.
Theodore Voorhees, First Vice-President Philadelphia & Reading Railroad system.

The headquarters of the delegation will be at the Victoria Hotel, London.

The American railway companies which are members of the congress are the Louisville & Nashville; the Pennsylvania; Denver & Rio Grande; New York, New Haven & Hartford; Chesapeake & Ohio; the Fitchburg; Richmond, Fredericksburg & Potomac; Arizona & Southeastern, and the Los Angeles Terminal.

Mr. M. M. Reid has been appointed Master Mechanic of the Richmond & Danville Railway, to succeed Mr. W. A. Brown, resigned.

Mr. Frank Scott, of the firm of Scott & McLean, iron brokers, of Pittsburg, and Vice-President of the Damascus Bronze Company, died suddenly at his home in Pittsburg April 20.

Among the laws passed by the North Carolina Legislature, just adjourned, was one requiring railroads to redeem unused tickets.

Speaking of the regular spring meeting of the presidents of the Vanderbilt lines, which was held in New York April 25, Mr. Depew said: "The prospect for future business, as outlined by those present, is very good, and everything is running smoothly."

There is a tree in western Australia called the jarrah tree, the wood of which is said to be almost everlasting. The natives make nearly everything of this timber, and it has never been known to decay and is poisonous to all insects. It does not burn freely, but only chars, which makes it specially valuable for building purposes.

The Guyandotte & Atlantic Railway Company has been incorporated in West Virginia. It proposes to build a line of road beginning near Huntington, W. Va., to run up the Guyandotte River and down Bluestone River to New River, and up New River to a point in Mercer County, near the line between the states of Virginia and West Virginia.

By a remarkable coincidence, three divisions of the Pennsylvania system are of equal length. These are the Chicago and Logansport Division, the Indianapolis and Vincennes Division, and the Pittsburg and Altoona Division all 117 miles. This equality in length was the result of mere chance, as there never was any attempt at uniformity in establishing such division points.

United States Minister Strobel, at Santiago, Chili, announces the settlement of an important question which has been pending for many months, namely, the rate of interest that the Chilian Government would guarantee to the projected Trans-Andean Railway. In a report to the State Department he says that the Chilian Congress on Feb. 9 passed a law which guarantees for twenty years to the railway company interest at the rate of 4½ per cent. on a capital of £1,300,000.

Half a dozen Welsh women began work about the middle of April in the rolling mill of the Monongahela Tin-Works at Pittsburgh. They receive the plates as they come from the rolls and separate the black sheets. This work heretofore has been done wholly by men. It is hard and rough. The women are paid $1.50 a day. Men received for the same work $1.35. The forewoman gets $1.75. This is the first time women have been employed at such work in this country.

The electric street railway lines of Atlanta are making very elaborate preparations to handle the expected crowds during the Cotton States and International Exposition. The grounds will be reached by five lines, and the terminal will be in the form of a double loop of tracks, which will enable any number of cars to roll in, unload, load and roll out in the shortest possible time without delaying the cars behind them. The terminal facilities of both the electric and steam car lines will be very ample.

Private advices from Guatemala received in St. Louis recently are to the effect that on March 15 the first 40 miles of the Ferro-Carril Del Norte of Guatemala were opened to the public from Puerto Barrios to Los Amates, and two trains are now running daily in both directions. By the end of the year Silvanus Miller, the contracting engineer, expects to have 80 miles completed and in operation. This railroad is being built by the Guatemalan Government, but all the labor and most of the material comes from the United States.

Comparative Efficiency of Eastern and Western Coal.

Mr. J. C. McMynn, writing in the *Electrical Engineer*, says: It may be interesting to some owners of plants to know what average evaporation of water per pound of coal is obtained in Chicago under ordinary running conditions, and below we give some averages obtained from tests carried out by Robert W. Hunt & Company, consulting engineers, who have a department devoted to conducting efficiency tests of boilers and furnaces.

Eastern coal, burned in plain furnaces (average of 11 tests):

Price per ton delivered	$2.94
Water evaporated per pound of coal from and at 212 degrees	8.35 lbs.
Cost of evaporating 1,000 pounds of water from and at 212 degrees	17.6 cents.

Eastern coal, burned in patent smokeless furnaces (average 10 tests):

Price per ton delivered	$3.06
Water evaporated per pound of coal from and at 212 degrees	9.32 pounds.
Cost of evaporating 1,000 pounds of water from and at 212 degrees	16.4 cents.

The above 21 tests included tests of Pocahontas, New River, Youghiogheny, Winifrede, Pittsburgh and Hocking, and were made under the ordinary conditions of the different plants.

Western coal, burned in plain furnaces (average 11 tests):

Price per ton delivered	$1.60
Water evaporated per pound of coal from and at 212 degrees	6 9 pounds.
Cost of evaporating 1,000 pounds of water from and at 212 degrees	11.6 cents.

Western coal, burned in patent smokeless furnaces (average 15 tests):

Price per ton delivered	$1 38
Water evaporated per pound of coal from and at 212 degrees	7.42 pounds.
Cost of evaporating 1,000 pounds of water from and at 212 degrees	9.3 cents.

The above twenty-six tests include tests of Illinois and Indiana lump, nut and screenings.

Briefly analyzing these results, we see that a patent smokeless furnace does not make the same increase of saving on eastern coals as it does on the cheaper grades of western coals. Many plants are so situated and arranged that it would not be economy to burn anything but the best grade of eastern coal or oil, while in others where ample capacity is provided the cheaper grades can be used to advantage. The cheaper the fuel the cheaper the cost of steam, within a certain limit, which limit is when the interest on the extra investment for boilers more than equals the saving made.

Comparing eastern and western coals burned on plain grates, the price of the western coal is 55 per cent. that of the eastern, while the evaporation per pound of coal is 82 per cent. of that obtained from eastern coal, and the cost of evaporating water is 66 per cent. or 34 per cent. saving on plain grates, leaving out the question of capacity entirely. When burned in some standard smokeless furnace (no steam jet devices averaged in), the price of the western coal is 45 per cent. of the average price of eastern coal, but the evaporation is 80 per cent. of that obtained from the $3.06 eastern class, and the cost of evaporating water is only 57 per cent., or a saving of 43 per cent. made in using cheaper coal.

The patent furnaces save 6.8 per cent. in the cost of generating steam, using eastern coal as fuel, but they save 20 per cent. with western coals. This seemingly large saving is attributable to the fact that when no smoke is made the combustion is good, because of a larger amount of air being supplied to the smokeless furnace, which allows of the chemical reaction necessary to combine the volatile matter of western coals with the needed oxygen.

From the above it would seem that smoke prevention means economy, and also that the fuel near us can be utilized by Chicago manufactories with advantage and saving.

Southern and Southwestern Railway Club.

The latest meeting of this club was held at Atlanta, Ga., April 18. The M. C. B. rules of car interchange were discussed with the view of effecting needed revisions. The subjects reported on are as follows:

What is the cause of uneven wear of driving wheel tires, running in the southwestern territory? Messrs. Wm. Rutherford, P. H. Schrieber, W. H. Hudson, committee.

What is the most economical methed of obtaining compressed air for general use in railroad shops, and its application? T. W. Gentry, John S. Cook, W. F. Brodnax, W. J. Hartman, committee.

Discussion of the report on counter-balancing of driving wheels.

Additional report of committee on draft sheets and discussion of the subject.

What is the most economical tonnage spring: The elliptic, half-elliptic, or the coil, considering the first cost, and the duration of efficiency of each, and its effect on the rolling stock and track? R. P. C. Sanderson, Geo. W. Morris, S. A. Charpiot, committee.

A Texas hailstorm on April 24 made sieves of frame houses, blockaded the Great Northern Railroad, and killed large numbers of live stock. The hailstones were as large as hens' eggs.

Personal.

Mr. S. B. Shaw has resigned as Master Mechanic of the Seaboard Air Line, at Raleigh, N. C.

Mr. J. T. McBride, General Manager of the Everett & Monte Cristo Railway, has resigned.

Mr. G. M. Hughes, General Manager of the Atlantic & Danville Railroad, in Virginia, has resigned.

Mr. Ira Petrie, formerly Master Mechanic of the Jacksonville South-Eastern, died at Jacksonville, Ill., April 4.

Mr. William W. McKim, formerly Purchasing Agent of the New York & New England, died at Boston, Mass., April 2, aged 67 years.

Mr. W. G. Nevin has been appointed General Purchasing Agent of the Atchison, Topeka & Santa Fe to succeed Mr. W. G. Tuller, resigned.

Mr. T. A. Switz has been appointed Purchasing Agent of the Minneapolis, St. Paul & Sault Ste. Marie Railroad, vice Mr. W. Watkins, resigned.

Mr. W. L. Wallace has been appointed Superintendent of Motive Power, Machinery and Rolling Stock of the Santa Fe, Prescott & Phœnix, with office at Prescott, Ariz.

Mr. Frank H. McGee, Master Mechanic of the Central Railroad of Georgia, at Macon, Ga., retired from that position April 1, and was succeeded by Mr. John Dempsey.

Mr. A J. Ball, until recently Master Mechanic of the Columbus, Sandusky & Hocking, has been appointed Master Mechanic of the Cincinnati, Hamilton & Dayton, with headquarters at Dayton, O.

Mr. E. M. Humstone, Master Mechanic of the Philadelphia, Reading & New England, at Hartford, Conn., has been appointed Assistant Superintendent of that road, with headquarters at Canaan, Conn.

Mr. George M. Phelps, Treasurer of the American Institute of Electrical Engineers, and publisher of the *Electrical Engineer*, of New York, died at his home in Brooklyn on April 11 of pneumonia, after a very short illness.

Capt. John G. Mann, who has been Assistant General Manager of the Mobile & Ohio, since March, 1894, was on March 25 chosen General Manager of that road, to succeed Mr. James C. Clarke, who continues as President.

Mr. J. M. Hale has been appointed Master Mechanic of the Hoosic Tunnel & Wilmington, at Readsboro, Vt. Mr. Hale was formerly connected with the motive power department of the Chicago, St. Paul, Minneapolis & Omaha.

Mr. F. D. Casanave, General Superintendent of Motive Power of the Pennsylvania Railroad, is said to be rapidly recovering his strength from a recent severe illness. He has been spending some time in Atlantic City, recuperating.

Mr. George A. Burt has been elected General Manager of the Ohio River Railroad. Mr. Burt is an ex-General Superintendent of the Panama Railroad Company, and was at one time General Manager of the Brazil Mail Steamship Company.

Mr. W. H. Fry, Superintendent of Car Department of the New York, New Haven & Hartford, has resigned, and the jurisdiction of Mr. John Henney, Jr., Superintendent of Motive Power of that road, has been extended over the car department.

Mr. William A. Nettleton, Assistant Superintendent of Motive Power and Machinery of the Kansas City, Fort Scott & Memphis, has been appointed Superintendent of Motive Power and Machinery of that road, with headquarters at Kansas City, Mo., to succeed Mr. J. S. McCrum, resigned.

The report that got started last month, and appeared in this paper as well as a number of others, to the effect that Mr. W. H. Taft, Superintendent of Motive Power of the Boston & Albany, had been appointed Purchasing Agent and was succeeded by T. B. Purves, Jr., is officially declared untrue.

Mr. W. A. Brown, recently Master Mechanic of the Atlantic & Danville Railroad, has left that service and is now open for another engagement. He has held the position for five years and has had 25 years' experience in the operation and maintenance of equipment. His present address is Portsmouth, Va.

Mrs. Mary Brown, one of the last remaining pensioners of the War of Independence, died near Knoxville, Tenn., April 15, at the age of 91. In 1824 she married Joe Brown, a soldier of the Revolutionary war, he being then 65 years old and she but 20. She was in Knoxville, March 12, to draw her pension of $12 a month, and though feeble seemed able to last many years.

A number of changes have occurred among the officers of the Southern Railway. The two grand divisions of the road had separate General Managers. Mr. W. H. Green, General Manager of the Eastern Division, is made General Manager of the whole road, and Mr. C. H. Hudson, who was General Manager of the Western Division, becomes Chief Engineer of the road. Mr. J. S. B. Thompson is appointed Assistant General Superintendent.

Mr. Thomas A. Bissel, Manager of the Buffalo works of the Wagner Palace Car Company, has resigned and is succeeded by his former assistant, Mr. E. A. Benson. Mr. Bissell held the position he has resigned nearly 10 years, and is one of the oldest car builders in the country. He invented a number of useful devices that are believed to have brought him financial success, and it is intimated that he will not again enter active work.

Mr. J. S. McCrum, for many years Superintendent of Motive Power and Machinery of the Kansas City, Fort Scott & Gulf Railroad, has resigned his office, but is to retain connection with the road and perform such duties as his health will permit. He has been with the road nearly 25 years, and retires because of advancing years and enfeebled health. He is succeeded by his former assistant, Mr. William A. Nettleton, a son of the president of the company.

Mr. George W. McGuire, well-known known and highly esteemed in railway supply circles, and representative of the National Malleable Castings Company, and the Butler Drawbar Attachment Company, died in Savannah, Ga., April 4. He had been suffering from aneurism of the heart for about two years, during which time he remained mostly in salubrious climates, spending the last winter in Florida and Georgia. When about to return North, early in April, he caught cold which developed into congestion of the lungs and killed him.

Mr. E. Clark, Jr., General Freight Agent of the New York Central Railroad since its consolidation with the Buffalo & Rochester Railroad in 1853, and for a year previous General Freight Agent of the Buffalo & Rochester, has, after 47 years continuous service in that capacity, resigned. This is a most remarkable career, and is probably without a parallel in the railroad history of the world. President Depew, in accepting his resignation, does not allow him to retire from the service of the company, but declares that his name must be kept an the rolls for the advice and aid his experience can give.

Annual Report of the Chicago, Burlington & Quincy Railroad.

The report of the Chicago, Burlington & Quincy R. R. for the year ending December 31, 1894, shows gross earnings of $24,667,132, decrease, $6,375,838; operating expenses, $16,284,060; decrease, $4,940,438; net earnings, $8,883,067; decrease, $1,435,400; other incomes, $1,938,852; increase, $167,760; total net income, $10,321,918; decrease, $1,267,640; charges, $7,530,786; decrease, $83,475; balances, $2,791,132; decrease, $1,184,165; dividends, $3,895,128; decrease, $65,124; deficit, $1,103,996; against a surplus of $15,044 in 1893.

The railroads controlled by the Burlington and not included in the report consist of 1,155 miles of standard gage and 169 miles of narrow gage owned, and 87 miles of narrow gage leased, which shows for the year gross earnings, $6,847,740; operating expenses and charges, $5,905,421; total net income, $1,020,871; surplus, over dividends, $42,279.

In his report to the stockholders President Perkins says: "For three years past in reducing expenses, repairs on rolling stock and buildings have not been fully kept up, and it is estimated that about $1,000,000 ought to be expended to put them in good shape. This will be done gradually, when business improves. Cars and engines needed for service are, of course, kept in order, and track and bridges have been well maintained. The net increase in the funded debt during the year 1894 was $2,978,500, bringing the total funded debt up to $125,540,400. On December 31, 1894, the total of the stocks and bonds outstanding was $207,544,600."

The showing is not as good as that made in the preceding year, as the gross earnings per mile were $4,384, against $5,582 in 1893. Operating expenses, including taxes, per mile were, in 1894, $2,894, against $3,817 in 1893. Freight earnings decraased 18.65 per cent., and passenger earnings fell away 33.54 per cent.

A Cold Ride.

The experience of a boy, who in "beating" his way home to Toronto, undertook to ride on a truck beneath the Empire State Express, is thus told by himself:

"I had hardly got under the car when the train started, and then began for me the most fearful ride that can be conceived. I had a warm cap, which was pulled down over my ears, and my coat collar was turned up, but as the velocity of the train increased, the cold become intense. As the train increased its speed everything whirled and tore around me. The cold went clear through me. I began to grow numb and sleepy and I knew the cold was overcoming me. I tried to get nearer the steam pipes, but could not move. The agony was something frightful. I can't tell just how long I was like this, when there came a swish and a great splash, and then I knew I was in water. It seems that the engine takes water in a trough in the track, and the water splashed up and all over me. I was so dazed I could hardly hold my head up and I let it fall down on the trucks. The cold in a moment or two froze my cloths stiff and then I began to feel a little warmer. I tried to move my feet, but could not. The numbing, aches and pains were agony, but I tried to keep my hands from freezing. It was needless for me to hold on. I was frozen tight to the trucks. I could not even move my head. I do not remember much of the latter end of my ride, as I was dazed, but I know we were going at lightning speed, and came to my senses hearing some one say, 'You had better get off there.' I had just strength enough to reply, 'I can't,' when I felt a tug and was torn loose from the truck."

The Variety of Fuels.

Besides the ordinary forms of fuel used for commercial and domestic purposes, such as coal, wood, petroleum, kerosene, gas, coke, charcoal and (on the British Isles) peat, there are numerous other forms in more general use than is commonly supposed; corncobs, either in their simple state or treated with inflammable mixtures or pressed into blocks, are largely used.

A large number of patents have been granted for utilization of coal dust, and a variety of materials for admixture with pulverized coal, and for holding it compacted into lumps or briquettes, have been employed. Among these materials are clay, molasses, sawdust, Irish moss, asbestos, lime, resin, cut straw, chaff, petroleum waste, peat, clam shells, charcoal from garbage, corn meal, wheat flour, sugar, seaweed, broken glass, lard, tar, forest leaves, and waste cork cuttings.

The waste of many industries is utilized as fuel, either by itself or mixed with other kinds of fuel. In most woodworking establishments the waste cuttings are so used, and in the shoe-manufacturing towns leather cuttings are said to form a large proportion of the fuel used by the poorer classes for domestic purposes. In many localities in the West corn has been largely used as fuel, and it makes a rousing fire. On the great Western plains "buffalo chips," the dried dung of the buffaloes, have cooked many a dinner for weary travelers. In Egypt, mummies; in British Columbia and among the Esquimaux, oil, blubber and inedible muscular fibre make fires for the people. Even the bodies of certain birds unsuitable for food, but rich in fat, are said to supply this need on the coast of Scotland.

Chemical products furnish ideal though comparatively expensive fuel. Alcohol is one of these, much used in the arts, giving a pure, hot, smokeless flame, which renders its use almost indispensable in some delicate operations. The principal products of all practically available fuels, of whatever nature, are water and carbonic acid. Many fuels give off a large amount of unconsumed carbon, either as carbonic oxide or in the form of black smoke.

The Great Northern's Entrance Into Seattle.

The Great Northern road reaches Seattle by running along the shore of Puget Sound, between the bluffs and the tidewater, for 50 miles from Everett. When this section of the road was built engineers who were familiar with the country warned President Hill that he would have great trouble and expense in maintaining the line, on account of the action of the continuous winter rains on the soil of the bluffs, which is a mixture of clay and coarse gravel, well salted and peppered throughout with boulders and small stones. At that time, however, Mr. Hill was an enthusiast for low grades and he could not be argued out of adopting that seemingly attractive water-level line along the Sound. The result is that those 50 miles of track cost more to keep open and maintain than any 500 miles of the Great Northern system, except the line over the Cascade Mountains. During the winter from 100 to 300 men are kept busy "shoveling scenery into the Sound," as the division superintendent describes the operation. Acres of soft stuff slip down upon the track, carrying huge trees from the tops of the bluffs. Sometimes the track is forced out into water and sometimes it is covered with tons of debris. There are constant and annoying delays to trains, and the pay-rolls of the shovel brigades amount in the aggregate to a very heavy sum.

After three winters' experience with his water-level line Mr. Hill is now forced to seek an inland route to Seattle by making a connection with the Seattle, Lake Shore & Eastern road near Snohomish, building a short cut-off and running his trains over the road of that company into the "Queen City."

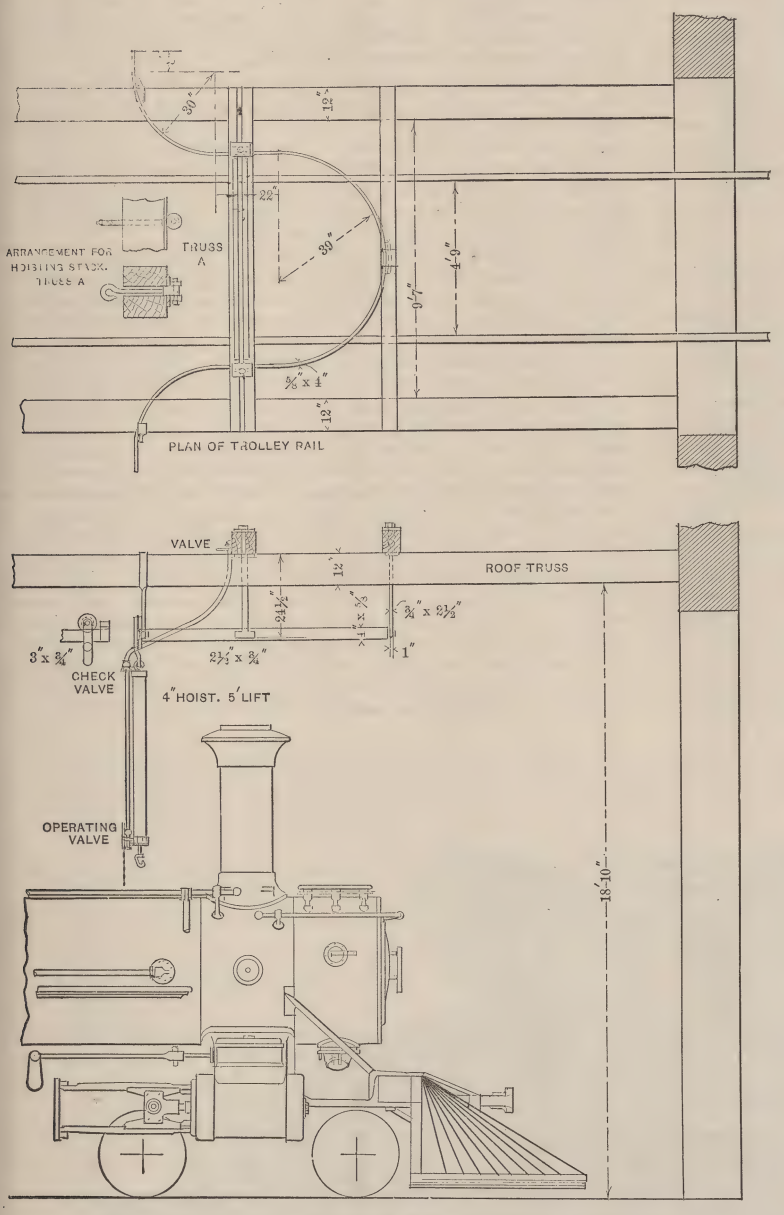
A "Hustling" Steamboat.

Puget Sound has a steamboat that, figur ativ ely speaking lets no grass grow under its feet. It is the *Flyer*, a screw steamboat, 200 ft. long, carrying passengers on the Sound. She ran 68,695 miles during the year 1894, which, is believed to be one of the best records ever made by a boat of that kind. This vessel, which belongs to the Puget Sound and Columbia River Transportation Company, makes four round trips daily between Seattle and Tacoma, 27½ miles, or 220 miles a day. The round trip of 55 miles is made in three hours. The distance between these two cities by rail is about 40 miles, but the *Flyer* makes such good time and is so punctual that she is said to be more popular than the railroad trains. The aggregate of lost time during the year is said to have been only 43 minutes.

Following upon the recent elimination of argon from the nitrogen of the atmosphere comes the announcement that Professor Ramsay, one of the joint discoverers of that inert body, has succeeded in isolating the hypothetical element helium. The existence of this body has been inferred by chemists for some time from certain chemical relations among known elements. Hitherto, however, it has baffled all attempts to find, and by an odd coincidence Professor Ramsay appears to have stumbled across it during the course of some investigations regarding argon. The particulars of the discovery were announced at the recent annual meeting of the Chemical Society in London.

Pneumatic Hoisting and Flue Testing Arrangements—Pennsylvania Railroad Shops.

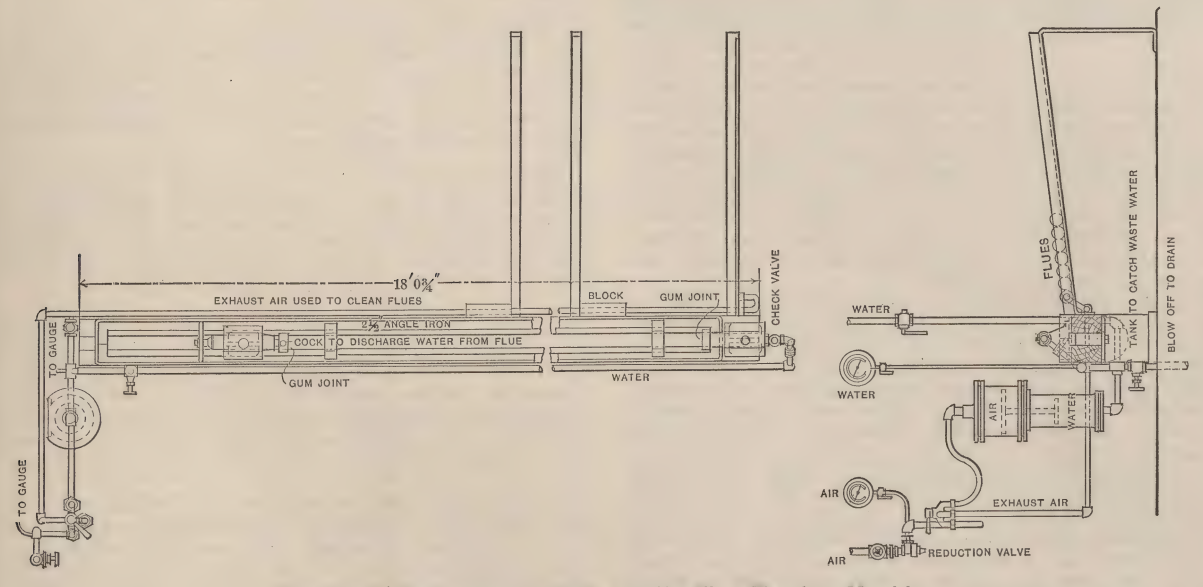
The following engravings illustrate two very useful arrangements in use in the Pennsylvania Railroad shops at Philadelphia, and we are indebted to officers of the mechanical department of this road for drawings from which our engravings are made, and for information thereto. Our first engraving shows a pneumatic hoist and trolley arrangement used in the erecting shop. As shown, it is situated near where the front of the engine stands. In dismantling and erecting locomotives there are always numerous small parts to be handled, the weight of which makes it very laborious to do so by hand, therefore an arrangement of this kind is very useful and a great labor-saver. In these shops this arrangement is used for lifting off and on everything pertaining to the steam-chest, crossheads, pistons, bumpers, drawheads, pilots, front-ends and doors of the same, and for removing and replacing steam-pipes, dry-pipes and exhaust-pipes.



Pneumatic Hoist and Trolley Arrangement.

Our second engraving shows a combined pneumatic and hydraulic flue tester. Its construction is so simple and so plainly shown in the drawing that a detailed description is unnecessary. The officers of the shop tell us that since the adoption of this machine "our men are able to handle with ease the amount of flues that it took two men to handle with the hand-pumping apparatus."

These appliances enable the work at this shop to be cut down considerable, and result in considerable decrease in the cost of repairs.



Combined Pneumatic and Hydraulic Flue Testing Machine.

Turkey's Railroads.

Henry C. Finkelstein, who has been connected with Turkish railroads for some years, gives some interesting facts concerning the transportation system in the Sultan's dominions. The total railway mileage in Turkey is now 3,123, the principal lines being from Constantinople to Bellova via Adrianople and Philippopolis, 562 miles; from Smyrna to Aiden, 507 miles, with branches in different directions.

The discipline on the Turkish roads is very severe. Negligence is punished with heavy penalties, and if a collision occurs all employees who share in the responsibility are likely to be sent to prison and, if any one is killed or injured, under sentences for long terms. Employees of the roads who are injured in service receive pensions, and if the injuries prove fatal their families are provided for. The law requires railroad companies to provide for the families of persons who are killed on their lines by accident, and those who are injured receive compensation to cover their board, medical attendance and loss of wages as long as they are unable to pursue their accustomed avocations.

At the same time there is a penalty of $1 for walking upon a railroad track in Turkey for every offense. Cattle and other animals found on the right of way of railways can be confiscated by the company, although the owner may redeem them by paying 25 cents each for sheep, dogs, goats, hogs and other small animals. It costs $2.50 to get a cow or horse out of a railway pound. Animals that are not ransomed within a given time are sold at auction for the benefit of the railway company, which, however, must return to the owner any sum in excess of the fine imposed by law and the cost of keeping the animal while in charge of the company. All articles left by travelers in the cars or in the station-houses are also subject to similar rules. They can be redeemed upon the payment of a fee, and at the end of a certain period all articles not redeemed are sold for the benefit of the company.

Every passenger must be in his seat when the last gong sounds, a few moments before the departure of a train. Travelers buying tickets must present the exact amount of money to the ticket agent, otherwise he is authorized to charge a commission of 4 per cent. for making change, which goes into his own pocket. Local tickets are good only for the train for which they are sold, and will not be redeemed, but through tickets will be accepted on all trains within the limit of time indicated upon them. Children under three years of age travel free, and between three and seven are carried at half rates. All gendarmes, prisoners of state, policemen and other officials are carried at half fare upon the presentation of a certificate of identity. Army officers and soldiers are carried for one-third fare upon the presentation of an "ilmihaber" certificate Soldiers traveling on duty for the Government are carried free upon the presentation of a "pestie" certificate.

Passengers found upon trains without tickets are required to pay three times the full fare between the place where they started and the first station reached after they are discovered, when they are allowed to buy a ticket for the rest of their journey at the regular rate. One hundred pounds of baggage is allowed for every ticket, but the traveler has to pay three cents for having his trunk checked. The Oriental express and trains from Constantinople to Vienna (44 hours) and to Paris (72 hours) run twice a week, and carry first-class parlor and sleeping cars. Similar trains run between Smyrna and Aiden.

Traveling Engineers' Association Circulars.

The following circulars have been issued by the secretary of the Traveling Engineers' Association to the members of the same:

Fuel and Water Supply.

The committee on the subject for discussion at the next annual meeting, viz.: "Could not the locomative service of the country be improved if the furnishing of feed water and coal was in the hands of the locomotive department?" desire answers to the following questions, and any other information on the subject that you can give will be thankfully received by the committee.

Fuel Supply.

Under the supervision of what official of your road is the locomotive fuel supply?

Assuming that your fuel supply is drawn from varying sources, and that it is consequently of a varying quality, what effort is made to localize these variations? Or in other words, do those controlling the fuel supply aim to keep it as near uniform as possible on a given district or division?

Has a systematic method been adopted on your road of districting the fuel supply? If so, please state fully, plans employed and results obtained.

What, in your judgment, would be the advantage gained by districting the fuel supply with the view of keeping it uniform in same territory?

Do you consider that it would tend to economy and improved service if your fuel supply was under the supervision of your mechanical department chief?

If fuel supply is handled by transportation department, do you think your mechanical department chief should be consulted with reference to quality of coal furnished?

Is the head of your mechanical department consulted with reference to any proposed changes in fuel?

Water Supply.

What department of your road is charged with the control and maintenance of the *water* service?

Do you consider that it would result in economy and improved service if the furnishing of water for locomotive use came under the direction and control of the mechanical department chief of your road?

Is the head of your mechanical department consulted with reference to quality of water furnished?

Does your road have feed water analyzed?

What is the life of flues in your best and worst feed water, and what methods have been employed to overcome effects of bad water?

Address all communications to W. R. SCOTT, 510 E. 2d Street, Newton, Kan.

W. R. SCOTT, GEO. GREGORY, S. W. SIMONDS, J. N. BARR, D. MEADOWS, *Committee.*

Instructing in the Use of the Air-Brake.

The committee on the subject for discussion at the next annual meeting, viz.: "When traveling engineers are also air-brake instructors, how can they best instruct and examine the engine and trainmen without the use of an air-brake instruction car or room?" desires answers to the following questions. Do not confine yourself to the questions asked. Kindly give the committee all the information you can on the subject:

1. What facilities, if any, have you for giving instructions to enginemen, trainmen and others?
2. Do you instruct by personal efforts, touching up the weak points as you may find them, or have you a regular system of instruction?
3. What method do you pursue in giving instructions on the road?
4. What method in the yard?
5. What method in the shops?
6. If a method, do you follow it strictly, or do you find it necessary to modify it according to circumstances; that is, do you adapt the pupil to the method, or the method to the pupil?
7. Should instructions be given continuously or at intervals?
8. In giving theoretical instructions do you endeavor to illustrate them by localizing defects in man or apparatus, providing a remedy and getting the pupil to explain as he understands it?
9. How many lessons of instruction should be given a pupil before a general examination?
10. Do you examine immediately after instructing, or do you have a time and place to examine or summarize instructions covering perhaps months?
11. Do you consider it imperative that those who are instructed in any branch of air-brake work should be examined often enough to keep them refreshed and in line?
12. How would you examine them? With what? And how often?
13. Have you authority to examine those who come in contact with the air brake? If not, should you have?
14. What authority do you think should be given you for this purpose? Please reply in full what you believe to be necessary.

Please state in detail what you believe to be the very best practicable method of instructing and examining, when there is no instruction car or room.

Direct all communications to George Holmes, Chairman, 610 Eighth avenue, S. W., Roanoke, Va.

GEORGE HOLMES, F. P. WILLSON, W. J. WALSH, F. N. RISTEEN, S. J. KIDDER, Committee.

The Railway Age has gathered statistics which show that 373 railroad companies are now building, or contemplating building soon, 20,547 miles of new road. Three thousands miles of this are being graded or under contract.

Communications.

Thickness of Arch Bars in Diamond Trucks.

Editor National Car and Locomotive Builder

Both practice, experiment and analysis show that where the angle and length of the inclined part of arch bars of a diamond truck are equal, the top of one should be the heavier, because wrought iron being stronger in tension than compression, then the lower bar being in tension should be thinner to give the same strength as the upper bar. The tests made by the M. C. B. Association demonstrated this, as the upper bar invariably failed when the whole was tested to destruction. Nearly two years since one of your contemporaries published drawings of a lot of new box cars, built by a Western road, in which the upper and lower arch bars were 1¼ inches thick. A correspondent of that paper pointed out that the lower bar, if only 1 inch th ck, would be stronger than the upper when 1¼ inches thick, and showed in the number of cars built by the road that over 90 tons of wrought iron was uselessly used in the lower bars—which would have been stronger even at 1 inch than the upper 1¼-inch bar. The paper, in replying to this communication, attempted to show that both bars should be of the same thickness, because the lower bar had bolt holes in it to bolt the oil box to.

The fact was overlooked that the *inclined* part of the lower bar has no holes in it, which was the part of the bar in discussion, and *the only part to be considered*, because the strain on that part of the lower bar to which the oil box is bolted is much less (because of the angle) than is the strain on the inclined part due to the angle. In fact a strain sheet will show that the part of the lower arch bar to which the oil box is bolted, even with its reduced section due to the bolt holes, is stronger than the inclined part, Practice shows that it is the upper bar which invariably fails by "buckling" or bending.

Recently a box or coal car built for this same western road was illustrated, in which the upper bar is 1¼ inch, and the lower bar 1 inch. Now, will you kindly explain whether the former practice of the road referred to when it made both bars 1¼ in., or the present practice where the upper bar is 1¼ inch, and the lower is made 1 inch, is correct. Evidently both cannot be right, and it does not take many hundred cars to make 100 tons of useless iron in the arch bars.

Yours, R. G. CONNANT.

Some Interesting Hydraulic Jack History.

Editor National Car and Locomotive Builder:

Under the above heading in your April issue you refer to Mr. Richard Dudgeon as being the inventor of the hydraulic jack, and then go on to say how he was aided considerably, in a financial way, by a New York druggist named E. Lyon, and wind up by saying Messrs. Watson & Stillman are his successors. Pray when did they become so and how? We are surprised that a paper of your usual truthfulness should give publicity to such a statement when you ought to know so well to the contrary. The facts in the case are these: Mr. Lyon did furnish Mr. Richard Dudgeon some capital, as stated, for which he was paid back a hundred fold. Messrs. Watson & Stillman succeeded Mr. Lyon, and not Mr. Richard Dudgeon, unless the infringing of Mr. Dudgeon's improved jack means succession. This they did in 1884, for which infringement they had to pay, and an injunction was obtained against them restraining them from making any more (see U. S. Circuit Court decision). This injunction is still in force.

Respectfully yours, F. P. & W. M. DUDGEON.

New York City, April 25, 1895.

Strength of Wood.

As a result of nearly 40,000 tests of timber made at the laboratory of the Washington University at St. Louis, under the direction of the forestry division of the Department of Agriculture, the following facts have been determined: Seasoned timber is about twice as strong as green timber, but well-seasoned timber loses its strength with the absorption of moisture; timbers of large sections have equal strength per square inch with small ones when they are equally free from blemish; knots are as great a source of weakness in a column as in a beam; long leafed pine is stronger than the average oak, and bleeding timber does not impair its qualities. It is stated that a large amount of chestnut felled in Alabama for the tanbark was allowed to rot because its value for railroad ties was not known The Division of Forestry called attention to the superiority of this timber for ties, and the wood is now so utilized, with a saving to that region alone of nearly $50,000 per year.—*Railway Engineering and Mechanics.*

A Bear Attacks a Locomotive.

Bears as a rule are pretty shy, but the other day one was discovered that was either crazy or a "tenderfoot." His lordship tackled a locomotive on the Northern Pacific, only to be knocked out in one round. About four miles from Garrison, as a train suddenly shot around a curve the other day, the engineer saw an immense black bear, weighing about 600 pounds, between the shining rails. That bear wasn't a coward either, for instead of getting out of the way or stampeding at the shrill screaming of the whistle, he simply stood his ground and prepared to battle against this loud-mouthed thing that vomited smoke. The engine hit the bear, but instead of butting him from the track it passed over him, the massive wheels crushing out poor bruin's life, leaving behind a mangled, bleeding, shapeless hulk. There wasn't enough left of that bear to collect a bounty on.—The *Helena Herald.*

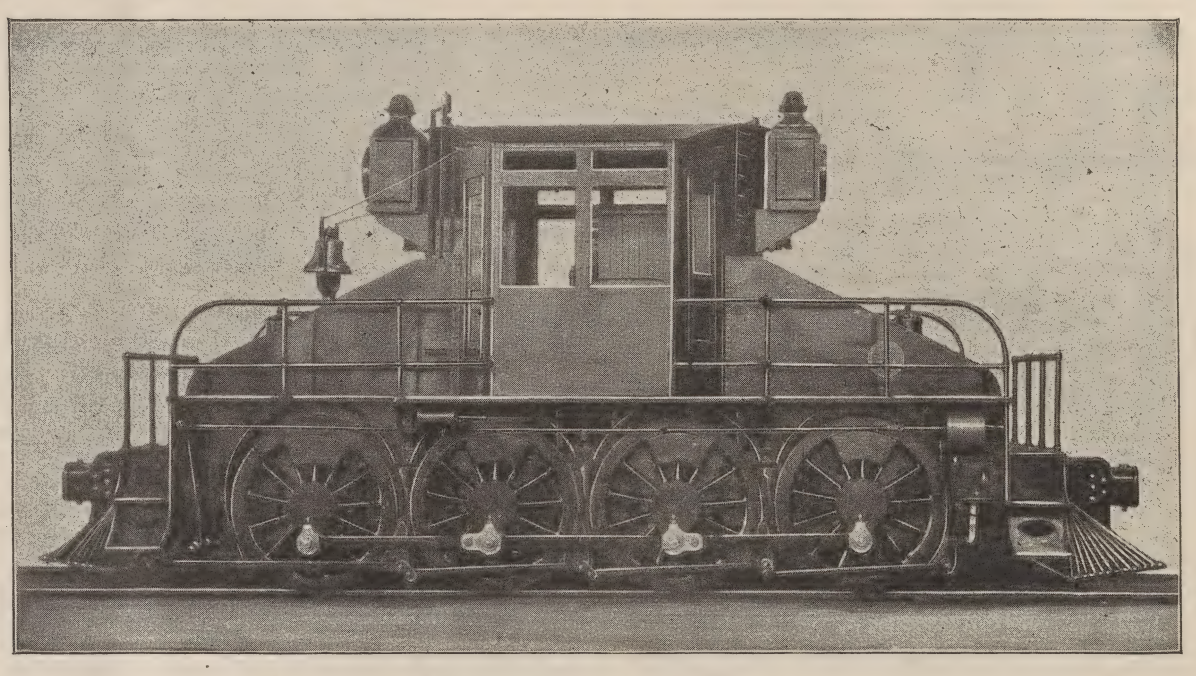
In the absence of a locomotive to place needed cars at an elevator in Argentine, Kan., recently, "Rajah," a large elephant belonging to a circus stopping there, was invited to move a string of 32 box cars. The brakes were released, the elephant put his head against the end car and after a few moments the line began to move slowly. The track was perfectly level, and soon the cars had rolled to the elevator.

The New York Central contemplates greatly enlarging its Grand Central Station in New York. The company is now negotiating for the whole block of land bounded by Forty-second and Forty-third streets and Madison and Vanderbilt Avenues. It is said that to acquire the land the company will have to pay $1,000,000.

The Sprague Electric Locomotive.

The electric locomotive illustrated by our engraving has just been completed at the Baldwin Locomotive Works, after designs by Messrs. Sprague, Duncan and Hutchinson. It is intended for special experimental work in handling heavy freight and in switching, and was built for the North American Company for this purpose. The locomotive resembles somewhat the ordinary consolidation type used for heavy switching work. There are four pairs of drivers coupled together by quarter cranked connecting rods The frame and the superstructure are symmetrical, and the frame is provided with freight buffers and iron pilots. The pedestal boxes are a special form made of cast steel and project inward, forming the brackets which carry the motors. The lower sides are arranged to be dropped out, so that the brasses can be readily replaced in the usual manner. These boxes are very large and heavy, and perform the duty of carrying both the axles upon which the armatures are rigidly mounted and the field magnets concentric to them. A stirrup projects from the upper part of each to engage the middle section of the inverted elliptical springs. There are four sets of springs arranged on the double three-point suspension system. In this way the whole superstructure is carried on equalizing springs. The drivers are 56 inches in diameter, the end ones only being flanged.

The motors, four in number, and alternating in position, are the Continental ironclad type, the field magnets, consisting of two steel castings, having two field coils placed at the ends of the motors, thus forming two consequent and two salient poles. The magnets are compound wound. The armatures, which were built by the Westinghouse Company, are of the slotted type. The motors are wound for 800 volts at 225 revolutions, which equals about 35 miles an hour when in multiple. About 250 amperes of current will be used, and, at 93 per cent. efficiency, each motor will give about 250 horse power. There will be a constant drawbar pull of over 10,000 pounds. To effect the prompt operation of the controlling system compressed air from the air-brake tanks is used. It is kept at a constant pressure by a special electric pump. The cab is provided with ammeters, voltmeters, whistle, bell, headlight, etc. The American driver brake is applied to every wheel. The cab, as seen from the photograph, is centrally mounted with wedge shaped ends and forward inclined sections running down to each end of the locomotive. The controlling apparatus in the cab is so arranged that the motorman sits at the right side looking forward, no matter which way he is normally running. The total weight of the engine is about 134,000 pounds, equally distributed upon the drivers.



A 67-Ton Electric Locomotive.

Mexicans on Mexican Railroads.

Speaking of the attitude of Mexico toward railroads, Mr. C. P. Huntington points out that the policy of the Mexican Government has been most liberal, large subsidies having been granted to all important lines but the International; and while with the increase of intercourse between railroads and the public there has arisen, he says, the desire for restraining regulations, there has ever been manifest the fullest respect for the chartered rights of the company, whose investments have been made without government contribution of any sort, and a willingness is shown to recognize the obligations of the government to co-operate with the railroad to protect those rights from injury so long as the reasonable requirements of the people for appropriate facilities are supplied.

What Mr. Huntington says regarding Mexican employés is also of interest. He expresses great satisfaction with the results of the employment of citizens of Mexico in the International company's service. They have charge at several stations and occupy many positions of responsibility in the general offices. At the end of 1894 over 60 per cent. of all employés were Mexicans. They are performing duties in every branch of the service, and they receive generally better remuneration for their services than is obtainable from other local industries. With the additions lately made to the machinery in the shops many foreign mechanics have been dispensed with, and their work is now being done by Mexicans in an entirely satisfactory manner. Mexican masons are working on bridge piers, and painters and carpenters are at work at different points on the road. At the close of the year the number of Mexicans on the pay-rolls of the company and the other enterprises affiliated with it in Mexico was 2,156, which certainly speaks well for the advancement of the Mexican people.

Frederick W. Ferguson, of Summit, N. J., on April 5 received a verdict for $10,000 damages against the Delaware, Lackawanna & Western Railroad, for injuries received in the Hackensack Meadow wreck.

The Protection of Wire Ropes.

Wire ropes are now so extensively used in many forms of mechanical construction that attention can very properly be given to their preservation. An article in the *Colliery Engineer*, contributed by Mr. John H. Janeway, says: "There are many users of wire rope who either shut their eyes to the disastrous effects of friction, or else use materials to modify them which cannot give the desired results with the conditions under which they labor; and they gradually become accustomed to a state of affairs with regard to their wire ropes which ill accords with the general excellency of their other machinery. A wire rope should be considered a machine of many parts, and cared for as such. The necessity of lubricating each wire of a rope (there are from 42 to 114 in the standard makes) can be easily appreciated when it is understood that they all change their relative positions to each other whenever the rope is bent.

"With a heavy tension on it, the wires grind upon each other, unless oiled. When passing around sheaves or rollers, unless the rope is well coated on the outside, that part will wear very fast. The problem is extremely simple in many cases, particularly in hoists free from water, where nearly any lubricant may be used without fear of its being washed or stripped off. Under other conditions, it is more difficult and complicated."

"The lubricant used for a wire rope must penetrate between all the wires, covering each with a thin film. As a preservative, it must prevent rust and be free from acids As a protection, it should turn water and other liquids, and form more or less of a cushion to prevent abrasion. A lubricant specially made to meet all the trying conditions to which wire ropes are subjected consists of tar, summer oil and mica axle grease, in such proportions as will meet the special conditions under which the ropes are to be used. The tar and oil must be free from acid. This combination thoroughly penetrates between the wires, prevents rust, and fills the cable, so that it has the appearance of a bar of iron. It sheds water successfully and does not strip off. Old cables which have been treated with this, when taken apart, show every wire bright and clean, the heart or hemp core being also in prime condition. Linseed oil, on the contrary, frequently hardens around the core, so that it rots and breaks down, destroying the cushion, which the hemp center ought to provide. As soon as the rope has been well filled with this compound the addition of a very little from time to time keeps it in good condition, so that it is economical besides. The best manner of applying it is by means of a drip, which pours it on in a fine stream while the rope is in use, care being taken to put it on very slowly."

The Chicago Subway, Arcade and Traction Company was incorporated April 2, with a capital stock of $15,000,000. The object stated in the charter is to construct subways in Chicago, and operate a line of cars with dummy engines.

In Egypt, at a recent council of the Ministers, held a Cairo, it was decided to extend the railway line from Keneh to Assouan. When finished, which will be in about 30 months, the line will have a length of about 180 miles. The Government guarantees to the concessionaires an annual interest of four per cent.

The annual report of the "Pan-Handle" (P., C., C. & St. L.) shows that, with 1,115 miles of road in operation, the business of the company for the year ending on December 31, 1894, resulted as follows: Gross earnings, $14,247,855; operating expenses, $10,765,519; net earnings, $3,482,330, net profit, $932,303; surplus, all lines, $635,491.

The Southern Pacific Railroad is considering methods for preventing train-robbery, but thus far no feasible plan has been found. It is thought that probably the best would be to place the express car in the middle of the train, thus making it more difficult to detach it from the remainder of the train, as the robbers would then have to divide their force, as recently recommended by a U. S. Army officer.

The Philadelphia & Reading and the Pennsylvania railroads have made no secret of the fact that the trolley lines to Germantown, Chestnut Hill and suburban points have proved formidable competitors of their branches to those suburbs, and that they have lost many passengers who find the trolley cars cheaper and more convenient means of communication with the city proper. It is not only to the suburbs named, but also to Manayunk, Darby and suburban stations on the line of the Central Division of the Philadelphia, Wilmington & Baltimore Railroad; that passenger travel has been diverted to the trolley lines. The Philadelphia & Reading has felt the competition with its Germantown and Chestnut Hill branch worse than the Pennsylvania Railroad has, and an effort to recoup its lost traffic has been made by offering inducements in the nature of additional trains and cheaper fares.

Central Railway Club.

Car Doors and Fastenings.—Revised Constitution and By-Laws.

At the March meeting H. H. Perkins, of Buffalo, said:

"The number of box cars in use in this country is about 512,000 without counting those of private owners not included in the equipment of railways, which would add several thousand. This shows considerably over 1,000,000 car doors, and with the many used several times in one day, it is safe to say that over 200,000 care doors are opened, closed and fastened each day. Allowing one minute for every time, it costs the railways about $500 a day for this one, generally considered, insignificant item, and if five minutes were used as was suggested might be taken, it would cost about $2,500 a day. In practice, frequently 10 to 20 doors must be closed in five minutes, particularly when a switch engine appears to draw a train from alongside a freight house, and as a general rule is only to allow one seal press at a station, someone has to hustle with it to prevent too serious delay to engine and business. Way freight men want and need a door that will handle easily either from the ground or platform, as often additional minutes at some station may cause hours of delay on the road; so all freight handlers are looking to you, gentlemen, to furnish a car door that can be opened, closed and sealed easily and quickly. There is no question but what safety, so far as injury to employees and others are concerned, must be the first consideration. Many times men have been seen to get hurt or just escape a severe blow on the head, when trying to open or close a door hung by hooks on a slide-bar either at the top or bottom. When such doors have been in use some time, and the strip on top is worn, they are very liable to let go very suddenly, and a man has to jump from under to save himself from injury. When doors hung this way are old and the bolts loose, often the door hangs by one corner and is very difficult, sometimes impossible, to replace with the conveniences at hand, and there it swings while the car is being switched, occasionally causing broken switch lamps, if not men's broken heads. The door of which the least complaint is heard among freight handlers is that hung on rollers or pulleys at the top, with projecting door guides below the bottom of the door, and wedge-shaped pieces on the bottom of the door to fill guides when the door is closed. These wedge-shaped pieces project about an inch, I would suppose one-half inch would be sufficient. These doors always work well, even when bolts that hold the pulleys to the door are loose or the door gets old or shaky. Some arrangement whereby the pulleys could be oiled occasionally, would be an improvement, but altogether, freight men are well satisfied with doors hung this way, and if made a few inches wider than the ordinary doorway, the lap over the doorpost at the back, and the door stop in front make the necessary protection against sparks and rain. For convenience, both from ground and also platform, fastenings should be located about one quarter the distance from bottom to top. This permits, on either ground or platform, the seal to be examined conveniently and expeditiously, and the examination of car seals has to be done by too many employees and too often and is of too great importance to be made more difficult than necessary.

"As an additional precaution, a small hole, or rather slot, through that part of the hook below the eye-bolt could be made for seal wire or tin strip, which, in connection with the other holes, would make a most secure way of sealing and very easy to examine seals; and there would be no wearing or pounding of seal wire, causing it to break, as when used in the same hole with the pin, a difficulty not heretofore mentioned but often met with. A door convenient for all the details of the business in which cars are used is what is earnestly desired by those who use the cars, and it does not follow that a convenient door must be either unsafe, imperfect, or expensive."

At the April meeting, held on the 13th, the entire session was taken up with the consideration of the revision of the constitution and by-laws of the club, and the report of the committee on revision of M. C. B. rules. By the new by-laws adopted, the method of conducting the annual election is changed. A nominating committee is to be appointed by the President at the annual meeting, and they are to present two names for each office to be filled. The regular meetings are to be held in Buffalo at 2 p. m. on the second Friday of January, March, May, September and November, and the one in January is to be the annual meeting. Members in arrears for dues are to be dropped from the rolls and will not receive the printed reports of the proceedings of the club until restored to good standing and in order to secure this, they will be required to pay up all arrearages.

The reports of the committees on Management of Steam Heat in Passenger Equipment, and Comparative Service of Flues in Boilers, were deferred until the September meeting.

Performance of Southern Pacific Locomotives.

The following table records the performance of locomotives on the Pacific system of the Southern Pacific Company for the month of February last:

Loco. mileage.	Freight train engines		801,867
	Passenger train engines		574,192
	Work train engines		68,206
	Switch engines		194,482
	Total engines		1,638,742
Car mileage.	Passenger car mileage		3,040,570
	Loaded freight car mileage		9,341,753
	Empty freight car mileage		3,610,634
	Work car mileage		163,798
	Total car		16,156,755
Cost per mile locomotives.	For repairs	Cts.	6.29
	For stores	"	.17
	For fuel	"	17.50
	For engineers and firemen	"	6.69
	For watching, dispatching and wiping	"	1.11
	For other motive power accounts	"	2.07
	Total cost		33.83
Loco.'s	Miles run to 1 pint lubricating oil		15.06
	Miles run to 1 ton of coal		27.66
Car service statement.	Average passenger cars per train		5.28
	Average loaded freight cars per train		13.90
	Miles of road operated		4,875
	Number of engines owned		723
	Number of engines in service		633
	Average miles run per engine in service		2,589

Average cost of coal per ton, $4.83.8; wood per cord, $3.8.87

NOTE.—Two empty freight cars rated as one loaded. Cost of hauling cars does not include expense of switch or work engines.

The Atchison, Topeka & Santa Fe earnings show an increase for the first week of April of $16,762 over those of the same period last year. For this year they were $551,331, against $534,548 last year.

Malleable Iron Carline and Sill Pockets.

It is well known that in the framing of freight cars the strength of important members of the structure is reduced considerably by the material which must be removed for mortises and tenons. This method of framing also makes it difficult to remove any single member of the car frame for the purpose of making repairs. These objectionable features are avoided by the malleable iron carline and sill pockets which the National Malleable Castings Company is making under patents controlled by Mr. W. E. Coffin, of Marshall, Tex. Views of these pockets are shown in Fig. 1 of the accompanying illustrations, the lower view showing several

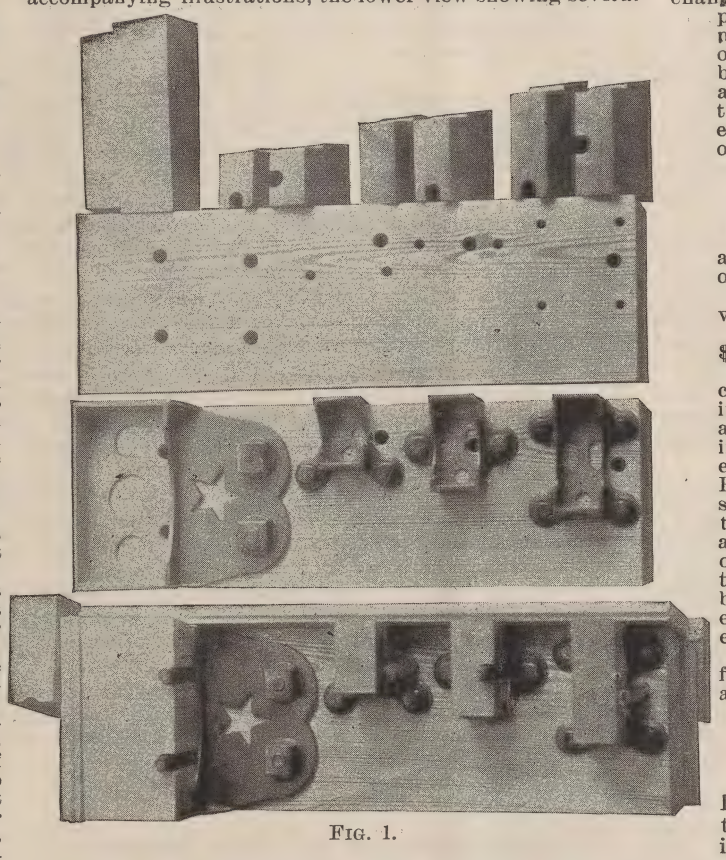


FIG. 1.

of them of different sizes attached to a side plate and with the ends of the carlines in place; the intermediate view shows the same pockets with the carlines removed, and the upper view shows the plate and carline ends drilled and ready to be put together. In Fig. 2 are shown pieces of freight car plates and carlines, which illustrate in a striking manner the way in which the parts are weakened by the present method of framing.

The advantages of these carline and sill pockets will be readily appreciated by all practical car builders, and may be summed up as follows: They save the time and expense of mortising and tenoning timbers and also reduce the cost of erecting the frame work of a car, and the sills and plates are not weakened as in the present construction. The time required in renewing end or side plates, carlines, or sills, is

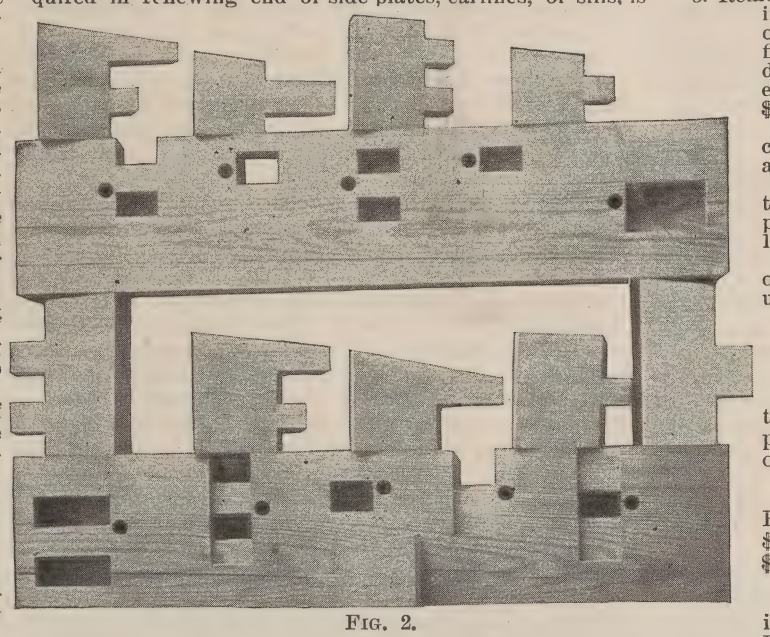


FIG. 2.

greatly reduced, as by removing the bolts which hold the carline or sill pocket a timber can be removed without spreading the frame or disturbing the adjacent parts. They are made in all sizes and shapes by the National Malleable Castings Company, from whom further information may be obtained by applying to the office of the railway department of the company, 1,525 Old Colony Building, Chicago.

Enameled Iron Signs.

Mr. F. E. Marsland, of 84 West Broadway, New York, makes a specialty of the manufacture of enameled iron signs that are specially adapted for station names and business signs of all kinds. They are made of material that will withstand the effects of the weather in all climates, and are made in any colors that can be fired up to 4,000 degrees of heat; the base is iron, which is coated with the requisite colors, each of which is amalgamated with the iron in furnaces until it attains a white heat.

Having a glaze surface they require no cleaning. The New York Central, the Manhattan and the Long Island railroads, and others, have adopted them as the standard for station names, notices, etc. That they are equally appreciated by many others is proved by their general use wherever they have been introduced.

These signs can be made in any size up to 10 feet long by 3 feet wide, and even larger by making them in two or more pieces. For colors, blue ground and white letters are mostly used, the contrast being very striking, but black and white, and yellow and black, are also much used.

Mr. C. P. Huntington, President of the Southern Pacific Co., was arrested at his office in New York City, April 22, on the charge of issuing an interstate pass to a resident of San Francisco. The action was evidently pure spite work, and simply caused Mr. Huntington some little annoyance before he was released on his own recognizance.

The Crane Automatic Air-Brake.

The Crane Company of Chicago has issued an elegant pamphlet, 9 inches by 12 inches, illustrating and describing the Crane Quick-Action Automatic Air-Brake. This company has for a number of years made a specialty of repairing air-brake equipment details, and the improved machinery and methods adopted in this work has greatly reduced the cost of such repairs, much to the advantage of railroad companies. For a number of years the Crane Company has been experimenting with a view of producing an entire air-brake system; the result is such a system that will not only interchange with the prominent brakes now in use, but has improvements in the way of fewness of parts and simplicity of construction. The system is now being tried on many of the prominent railroads of the country in both freight and passenger service, and although the apparatus has been subjected to the most severe tests there has not been a failure of any kind. Those interested in air-brake equipment should secure and study one of these pamphlets.

He Wanted to Know.

It was a farmer-looking man, with one arm in a sling and a bandage over his eye, who wandered into the office of the superintendent.

"I was in that ther little smash-up down nigh Plunkville," said the farmer-looking man; and then he smiled.

"I guess he can be fixed up for not more than $50," thought the superintendent.

"Yas, I was there," continued the visitor, with a chuckle. "Jist sailin' along, smooth as grease, listenin' to a hook-nosed feller tellin' a funny story, when all of a sudden—kerblip! That there ole car went sailin' so high that I could see the gray hairs in the whiskers of the man in the moon, and then she come down. How she did come down! And when I come to, there sat that hook-nosed feller with his hook-nose changed to a pug; another feller, 'bout seven foot high, was hung across the bellrope like a snake hung up fer rain, and over in the woodbox was a fat woman jammed in so tight that she couldn't even holler—couldn't do nothin but make faces. By gravy, it was the funniest time I ever had in all my life. And so, I thought how much extry you thort I'd orter pay fer the fun you gimme."

The superintendent sat there with his mouth open for so long that the farmer-looking man grew alarmed and fled.—*Cincinnati Tribune.*

Some Causes of Fires.

Mr. Hugh B. Ely, Superintendent of the Insurance Department of the Pennsylvania Railroad, has issued the following "Analysis of the Causes of Fires," covering a period of nine years, 1886-1884, inclusive:

1. Inherent Causes, Avoidable—Consisting of such heads as from the construction, occupancy, or character of risk are inherent or usual in its class, viz.: Defective flues stoves and stove pipes, gasoline, heating arrangements in Eastman heater cars, lading of hot ashes and coke, over-heated stoves, pipes, etc., sparks from locomotives, spontaneous combustion, live coals or cinders from locomotives. Total number of fires under this head, 603; amount of loss, $101,846.
2. Direct Cause, Generally Avoidable—Includes such hazards as are not necessarily incident to the risks, but generally found present, viz.: Carelessness of employees, electric light wires, lamps or torches, wrecks and collisions, overturned stoves, explosion of ladings and self-ignition of ladings. Total number of fires, 241; amount of loss, $337,535.
3. Remote Causes, Generally Unavoidable—Hazards not incident to risks and not usually under control of our people, viz.: Adjacent burning property, fireworks, forest fires, lighted cigar or match dropped, lightning, matches ignited by rats, mice, etc. Total number of fires, 94; amount of loss, $90,309.
4. Lawlessness, Unavoidable—Such as riots, incendiarism, tramps, etc. Total number of fires, 40; amount of loss, $49,457.
5. Unknown—Many of which would come under the head of "Carelessness of Employees" if the proper cause were stated. Total number of fires 177; amount of loss, $213,111.

Total, 1,155 fires, $1,092,258. More than two-thirds of the number of fires and over half the losses come under the head of avoidable.

Trolley cars are to be introduced in Cairo, Egypt

The largest gold coin in existence is said to be the gold ingot, or "loof" of Annam, a flat, round piece, worth about $325, the value being written on it in India ink.

The earnings of the Chicago, Milwaukee & St. Paul Railway for the second week of April were $457,204; for the corresponding week of 1894, $528,716; decrease, $71,512.

Thirty thousand dollars was awarded by a jury in a United States circuit court recently to Charles Heathorne who sued the Baltimore & Ohio Railway for $100,000 for the loss of both legs and the crushing of an arm in a collision in Indiana.

Egypt, once the center of this world's civilization and learning, contributes only onions now to mankind; and to make matters worse, we are informed that the popular "baeli," as the Egyptian onion is called, owes its fine flavor as well as its size to the fact that the fields in which it is grown are fertilized with the powdered mummies of the sages who flourished on the banks of the Nile three and four thousand years ago.

The New York Central & Hudson River Railroad announces that hereafter baggage of its patrons may be checked from their homes or hotels in Brooklyn, New York, Albany, Troy, Utica, Syracuse, Rochester, Buffalo or Niagara Falls to their homes or hotels on any of these points. For this service a charge of $1 a piece will be made, which will cover the transfer at both starting point and destination. This arrangement will not apply to commercial baggage, but only to the ordinary personal baggage of passengers.

Alton, Ill., has become a railway point of largely increased importance since the Burlington company completed its great bridge across the Mississippi at this point and across the Missouri at Bellefontaine Junction, a quarter of a mile or so beyond. Since April 1 all Burlington trains cross the river there, and the traffic arrangement by which, for many years, it has used the Big Four tracks from East Alton south to East St. Louis has been abandoned. The Burlington has inaugurated an independent suburban traffic over its west side short route, putting on nine daily passenger trains each way.

Cast Iron Chilled Car Wheels.*

BY WM. W. LOBDELL.

Cast iron chilled car wheels are distinctively an American product, although manufactured to a limited extent in Austria and Sweden. The output, from possibly 10 or 12 wheels per day in 1830, confined to, at most, two or three establishments, has grown to one of millions; the product of more than 100 establishments, controlling millions of capital and employing thousands of skilled workmen.

Comparatively few persons—even if actively engaged in railroad management—have acquainted themselves with their mode of manufacture and consequent characteristics, and, therefore, are often led into unwise conclusions as regards the limits of their efficiency. To such it may be interesting to note that when certain kinds of gray cast iron are melted and poured against a metallic mold, that portion of the iron next to the mold becomes hard, white, crystalline and brittle, while the interior portion remains gray and more or less tough and fibrous. This conversion of the iron that comes in contact with the metallic mold, into the hard, white variety, is called "chilling," and it is upon this principle that the manufacture of chilled car wheels depends. This property of chilling, which certain irons possess, must have been known to iron founders at an early day, for we have evidence of the fact that parts of plows, faces of forge hammers, punches for punching holes in wagon tires, rolls for rolling metal, and various other implements, were chilled long before the manufacture of car wheels.

As the early mode of smelting iron ores was with charcoal, it follows undoubtedly that chilled castings and chilled car wheels were originally made exclusively from charcoal irons; and although later developments have demonstrated that, under certain conditions, coke or anthracite irons possess this property of chilling to a certain extent, they have not come into sufficient prominence for us to consider them as important factors in this branch of manufacture; so that to produce the best results we may consider the use of charcoal iron as indispensable. All irons do not possess the property of chilling, and many that do possess it are not well adapted for use because of characteristics which would render the wheels made from them unreliable.

Noting, then, this peculiar property of chilling, it is obvious that the plates and hub of the wheel must be cast in a sand mold, the result being that they are soft enough to be bored or machined, while the tread is so hard that the finest tempered file will not affect it. What, then, is this peculiar property of chilling? The supposition is that the chemical difference between the chilled portion of a wheel and the plates or hub is simply in the proportion of combined and free or graphitic carbon, that of the chilled part being high in combined carbon, the free or graphitic having been changed to combined by the rapid cooling of the tread by reason of being cast against a metallic mold, technically called a chill.

This rapid cooling of the tread of the wheel—the metallic mold in which it is cast being a good conductor of heat, while the sand mold against which the hub and plates are cast is a poor conductor—causes an undue strain upon the wheel, which must be relieved in some manner or the wheel would be unfit for service. With the adoption of the form of pattern such as is used to-day came the necessity for some mode of slow cooling and annealing. Probably the first method practiced was to take the wheels from the molds in which they were cast as soon as the iron was set and cover them up in hot sand or ashes and allow them to remain several days until nearly cold. Another was to lay them on the floor and build a fire around the tread so as to bring the temperature of the tread up to that of the hub and plates and then allow them to cool slowly. To a certain extent both of these methods accomplished the desired results, and were probably sufficient for the requirements of the times in which they practiced. The latest and probably the best plan is to place the wheels, as soon as they can be removed from the molds, in tight pits lined with fire-brick or some other substance that will stand the heat, ten or more in each pit. The wheels are allowed to remain in the pits several days, and are not removed until all tendency to fracture from strain has been removed.

From this hasty *résumé* of the mode of manufacture, it is obvious that, to insure a thoroughly safe and reliable wheel, great care must be taken in the selection and manipulation of the material used, as well as in the treatment of the wheel after it is cast; indeed, so well is this known, that the manufacture of chilled car wheels is considered as entirely separate from ordinary foundry practice, and is carried on in establishments especially adapted to the work.

The efficiency of cast iron chilled wheels depends upon their strength and wearing qualities. If the specifications and physical tests formulated by expert mechanical engineers and adopted by the most prominent railroads of the country—and which are now much more severe and exacting than those first formulated—can be taken as the maximum required to meet the conditions of the increase in speed and weight of equipment of the present time, then the limit of strength of cast iron wheels has not been reached, as they are successfully met by all reputable manufacturers; and as long as charcoal irons can be produced approximating 35,000 to 40,000 pounds tensile strength per square inch, it is not likely that the limit of strength will be exhausted until the speed and weight of equipment are increased beyond anything now contemplated. Assuming, then, that cast iron chilled wheels meet all the requirements of the physical test and specifications as to strength and depth and character of chill, we have yet to consider their wearing qualities.

We have seen that the chilling process has transformed the iron in the tread of the wheel from a soft, dark colored metal with a semi-fibrous fracture, into a metal white in color, hard in character and with a crystalline fracture. If a proper mixture is used, this chilled iron is harder than any steel that can be safely used in a tire, and consequently, under favorable conditions of service, should give excellent mileage results—instances being numerous where a mileage of 200,000, in some cases 300,000 miles has been obtained from 30 and 33-inch chilled wheels. These results cannot, however, be produced with the use of inferior irons, and they are not one of the conditions resulting from this era of extremely low prices.

The separation of the iron in the tread of a wheel into crystals by this peculiar process called chilling, should indicate that although it provided a wearing surface of extreme hardness, yet under certain conditions of service its peculiar crystalline structure would render it liable to defects not applicable to a metal of the structure of wrought iron or steel.

Probably more serious defects occur in cast-iron wheels from the excessive use of the brake than from all the other causes combined. Excessive heat will destroy the life of the "chill." If by any process it is continued to a "red heat" point, it eventually transforms the crystalline structure back into the semi-fibrous. The application of the brakes, when severe enough to slide the wheel any considerable length of time, results in the heating of the tread of that particular point to such a temperature that a separation of the crystals composing the chill occurs, as can be noticed by fine fire cracks on the surface; further service results in a disintegration and shattering out of these crystals. As a result, shelled-out spots occur, such spots being readily distinguished by their ragged, cuppy appearance, and the absence of a high point in the center (like the defect termed a blotch, for which the manufacturer is generally held liable.) If the tread of the wheel is broken through these shelled-out spots, the chill will be found to be discolored by the heat to a deep violet color, which discoloration can be produced in no other way.

The sliding of chilled wheels results not only in the disintegration and shattering out of the chill, but, by expanding the tread, in cracked plates and brackets, and other defects which necessitate the removal of the wheel. If the application of the brake could be more carefully regulated, the life and safety of the wheels would be increased 100 per cent., and many thousands of dollars saved to those who use them.

* Abstract of a paper read at the last annual meeting of the Association of Manufacturers of Chilled Car Wheels.

The Beginning of the "Pony Express."

Mr. Alexander Benham, of Butte City, Mont., during a trip East recently gave the following information about the famous pony express of which he was the manager, and which ran across the Western plains and mountain ranges to the Pacific coast in 1860:

"The first express ever run across the plains was started by a man named Butterfield in 1858. It started at Little Rock, Ark., and followed a southern route through Arkansas, New Mexico, Arizona, and then to Los Angeles, Cal. About two years later, in 1860, our company was formed for the purpose of carrying the mails to the Pacific coast. It was known as the Central Overland California and Pike's Peak Express Company. William H. Russell, Alexander Majors and a man named Waddell formed the company, and the contracts with the Government for carrying the mails were made out in their names. I was chosen manager and had my office in Denver.

"This was long before Ben Holiday was known, and those accounts which have been saying that he was the man who first established the 'pony express' are altogether wrong. The records at Washington will show that I am right, and that two lines of overland express were in operation at the time he started his express. However, the southern route run by Butterfield did not have as much prominence as ours, which for years was known as the 'pony express' route. It started in at St. Joseph, Mo., running through Nebraska to Fort Kearney, to Fort Laramie, Wyo., thence to Denver, to Salt Lake City, to Placerville, Nev., and to Sacramento, Cal. The whole trip extending half across the continent was made in 17 days, when no accident befell, and accidents were not so numerous as some people have imagined. From St. Joseph to Denver the trip took seven days, and from Denver to Sacramento was a journey of 10 days. That was, of course, by the regular stage route, and little time was lost in making it.

"To accommodate our business we had about 150 coaches, most of which were kept running all the time. To haul them we had 1,500 horses scattered along the route from St. Joseph to Sacramento. In addition, we had 6,000 or 7,000 head of cattle, which were used in hauling heavy freight and transporting feed for the horses and provisions for our men. You can see that the business was not by any means a small one, and it continued to grow as long as there was any use for such means of transportation. This was until the completion of the Union Pacific Railway to California in 1870. Then overland traffic and mail service could be managed to better purpose by the railroad, and our pony express went out of existence. But up to that time, from the day that the route was first opened in 1860, its business had steadily increased. Even the building of the railroad assisted us, for our line was the best adapted for carrying to Western stations employees and provisions."

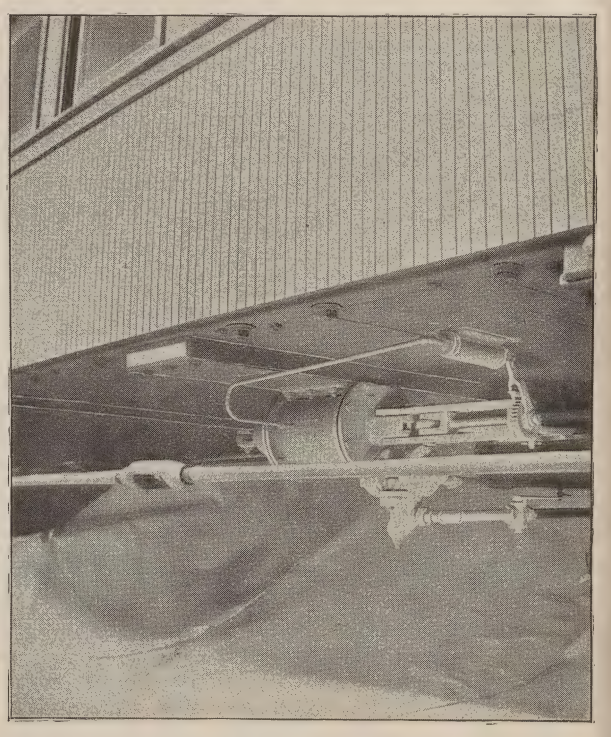
The mighty Pharaohs of old never dreamt of the indignities that might happen to a mummy or they certainly would have favored cremation. The embalmed remains of one of these august sovereigns was recently shipped to Cairo, but the package was halted at the gates of the city and the payment of a tax demanded. The man in charge of the mummy had already paid full railway fare for himself and Pharoah, after a vain effort to prove the right of the latter to be considered a deadhead. He demanded to see the schedule by which a man who had been dead thousands of years could still be subject to taxation. The official, after some perplexity, said that Pharaoh must be placed in the category of dried fish, and that the duty was 3 piastres—about 15 cents.

The McKee Slack Adjuster.

The brake slack adjuster illustrated in the accompanying engravings is the invention of Mr. M. E. McKee, of St. Paul Minn., and is being manufactured and introduced by the Q & C. Company, of Chicago. This device embodies several novel features, the principal one being the use of an auxiliary or take-up cylinder, actuated by air from the brake cylinder, which supplies the requisite power, and a screw threaded pull-rod and ratchet mechanism, by which the cylinder or floating lever, as the case may be, is adjusted in position.

Several forms of this adjuster have been made, but the one illustrated has been proved by experience to be the most practical and efficient. Referring to our illustration, which shows the adjuster applied to a 10-inch passenger brake cylinder, the cylinder lever is fulcrumed on the pin and the jaw. This pin slides in the slot in the malleable casting or stirrup, which is bolted to the lever bracket on the cylinder head. The jaw is held in position by a screw threaded rod, on which is cut a square thread of ¼-inch pitch. The rod is formed with a T-end to engage with the jaw, and passes through a hole in the end of the stirrup. A ratchet wheel, with an internal thread in the hub, works on the pull rod, and is prevented from moving away from the stirrup by the small bracket shown. A ratchet lever and pawl are pivoted on the outside of the hub of the ratchet wheel, and are actuated by the piston rod of the take-up cylinder. From the end of the take-up cylinder a ¼-inch pipe leads to the air-brake cylinder, which it enters at such a distance from the end that if the brake piston travels above the predetermined length air is admitted through the small pipe to the take-up cylinder; when this occurs the piston of the small cylinder is forced out, moving over the ratchet lever and rotating the ratchet wheel about one-eighth of a revolution. The screw thread of the ratchet wheel thus moves the pull rod, and with it the end of the cylinder lever $\frac{1}{32}$ inch, which insures a fine and regular adjustment of the brakes, and a frequent action of the mechanism.

When the brake is released the air from the take-up cylinder escapes through the back head of the brake-cylinder and the piston is forced back by a spring into position for another stroke. It is obvious that the brake-piston can be adjusted to any desired travel by varying the location of the port by which the quarter-inch pipe enters the brake cylinder, and that once the length to which the stroke is to be adjusted is fixed it cannot be altered by any tampering with the adjustment.



AIR-BRAKE SLACK ADJUSTER.

For freight cars the adjustment is made at the end of the floating lever, the threaded rod and jaw working in and taking the place of the floating lever fulcrum. The principle and method of operation in the freight adjuster is so similar to that used for passenger equipment as to require no further explanation.

The McKee patents fully cover all methods of adjusting the piston travel by the use of air, and after three years' careful experimenting the form above illustrated has been adopted in perference to all others, on account of its advantages of simplicity, decreased cost both for application and maintenance, its comparative immunity from dirt and snow, and "get-at-ability," which have been found to far outweigh any theoretical advantage from taking up the slack at any other point.

In addition to this, the strain to which the adjuster is subjected is entirely independent of the braking power, whereas, with an adjuster applied to any other position, the requisite strength must vary considerably with the leverages employed. Since only $\frac{1}{32}$-inch slack can be taken up at one application of the brakes, there is no liability for the piston travel to be shortened by an emergency application to such an extent that binding the shoes on the wheel while running might occur. Other types of adjusters have given trouble in this respect.

No practical objection whatever has been found in this arrangement against adjusting the piston travel at the cylinder lever, or for freight-cars at the floating lever, and the adjuster illustrated above has been in use on passenger and freight cars, on the Great Northern Railway, running both on short distance and transcontinental trains, in the latter

service having been through snow blockades in the Cascades, and the sand and dust of Northwestern summers in the Dakotas, and has so far never cost a cent for repairs, or failed to perform the work in any particular. There is nothing in this device which is liable to get out of repair, the only part needing occasional renewal being the packing leather in the small cylinder, and this has not yet been the case in any of the adjusters so far in service. The work done by these adjusters has fully justified the inventor's claim of a cheap, accurate and reliable device for adjusting the piston travel of air-brakes to any desired length, and one that will cost almost nothing for repairs. Further information will be given by application to Mr. C. F. Quincy, care of The Q. & C. Company, 705 Western Union Building, Chicago, Ill.

A Device for Strengthening Center Sills.

Mr. Charles A. Smith, of South Chicago, Ill., has invented and secured a patent on the arrangement illustrated herewith for strengthening the center sills of cars. Mr. Smith is a practical car builder and has given much study to the subject of durable car frames. The necessity of increasing the strength of draft gears has been given much consideration in recent years, and some progress has been made in that direction, but little attention has yet been given to strengthening the sills, and especially the center sills of freight cars near the ends. The buffing and hauling strains come mostly on these sills and fall most heavily on that part between the end sills and body bolsters. Mr. D. L. Barnes, in his very able paper on Draft Gears for Freight Cars, read several years ago before the New York Railroad Club and published in the NATIONAL CAR AND LOCOMOTIVE BUILDER for June 1892, said :

"Perhaps it is not the weakness of what is more strictly speaking the draft gear that causes a majority of the failures in service ; it may be that the cause lies in the sills, as it is noticeable from an examination of cars on repair tracks that the timber of both the draft and center sills taken out is fractured and broken, yet it is generally of a better quality than when first put in. It is, in fact, a high class of seasoned lumber, such as cannot be purchased in the open market. The timber which is put in place of that taken out is not as good quality as that which is removed ; hence, the process of repairs is a substitution of unbroken green timber for fractured seasoned timber. Does not this indicate that either we are not using a size of timber large

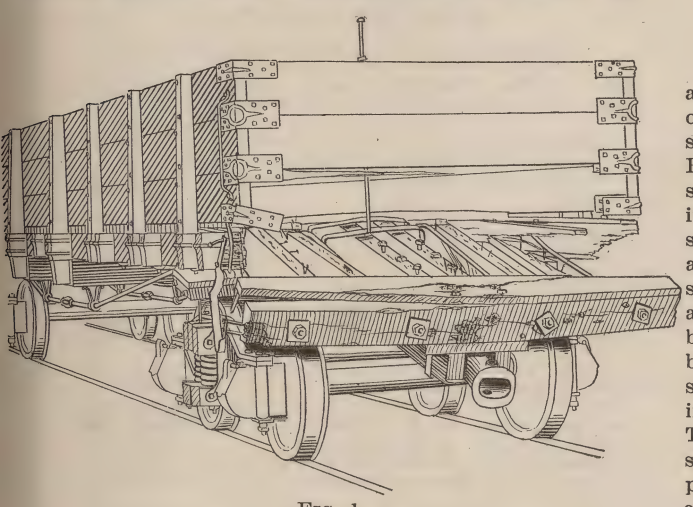


FIG. 1.

enough to withstand the shocks, or that the timber is badly placed to resist the strains that are imposed upon it? This is a question which should be answered before a standard car or draft gear is selected."

Mr. Barnes illustrated this point by photographs of damaged car frames showing the fracture of a car framing in a collision without injury to the draft gear. This was a light pressed steel gear, yet it evidently was stronger than the timbers of the framing. The photograph reproduced in Fig. 1 also shows about the same condition of affairs. It is these classes of breakage that Mr. Smith's device aims to prevent. The ordinary form of construction is shown in Fig. 2, and the proposed improved form is shown in Fig. 3. Usually when center sills are broken they fail over the body bolster, where they are weakened by bolt holes

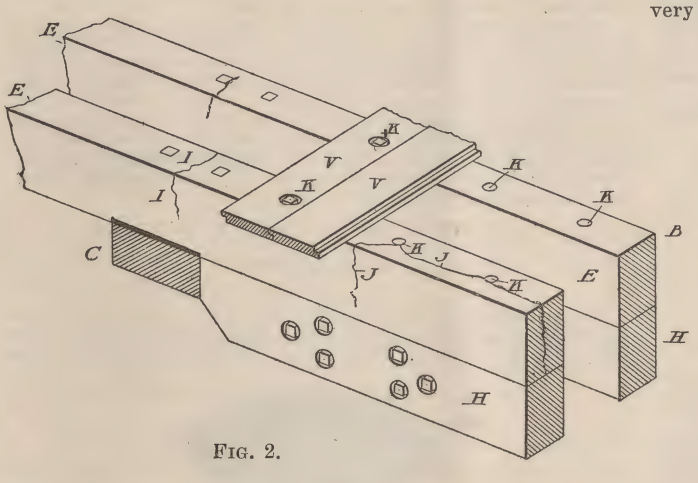


FIG. 2.

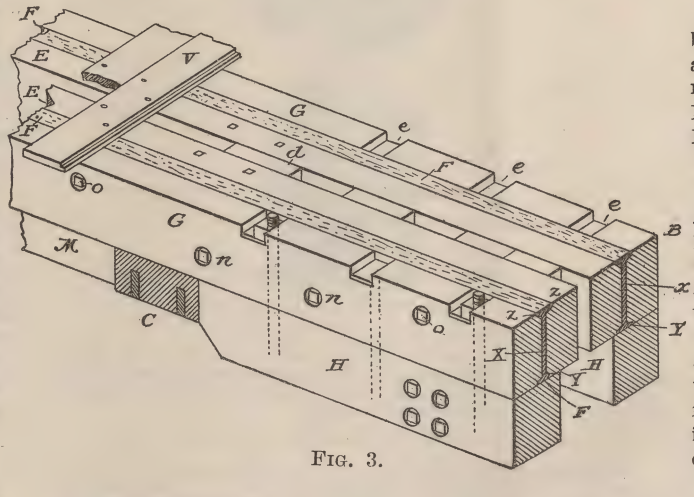
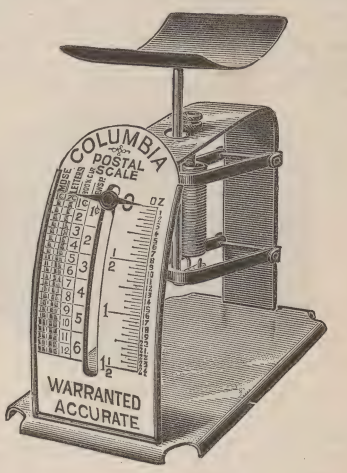


FIG. 3.

and gains. Their failure frequently causes the breakage of other sills, and it is estimated that the renewal of center sills averages about 60 per cent. of all long sill replacements. By the arrangement illustrated herewith the ordinary center sills are reinforced with an I-beam and auxiliary sill extending back over the body bolster. The I-beam is of Bessemer steel with short beveled flanges 1¾ or 2 inches across the top and bottom, and weighing about 10 or 12 pounds per foot. As shown in Fig. 3, these are interposed between the center sills and the short auxiliary sills and all bolted firmly together, blocks being placed between the two center sills and the bolts passing through these, as shown in Fig. 3. In this design the draft gear is attached to the short auxiliary sills, instead of to the center sills as is now the common practice. This arrangement not only greatly strengthens the center sills, and enables them to withstand greater shocks, but also provides that if breakage does occur it shall be to the short auxiliary sills and not to the center sills. The short auxiliary sills can, of course, be cheaply replaced. The device is calculated to greatly reduce the cost of freight car repairs, and to facilitate the prompt movement and interchange of cars. The inventor, whose address is given at the beginning of this article, has prepared a pamphlet which gives a much more detailed description of the device than we have space for, and those interested in the matter should send for one.

The "Columbia" Postal Scale.

The cut herewith is an accurate illustration of a very convenient scale for weighing mail matter. One of its pointers indicates the weight of the article, and the other pointer shows the amount of domestic postage necessary for newspapers, circulars and books, letters and merchandise. A glance at the dial will explain how simply and accurately this is done. It is made of brass, nickle plated, and has a very nice appearance. The spring has free action, and can



be easily regulated. The whole arrangement is very strong and simple, and as we have one in use in our office we can recommend it as being admirably satisfactory in every way. It is called the "Columbia" postal scale, and is sold by Messrs. Rand, McNally & Co., 166-8 Adams street, Chicago.

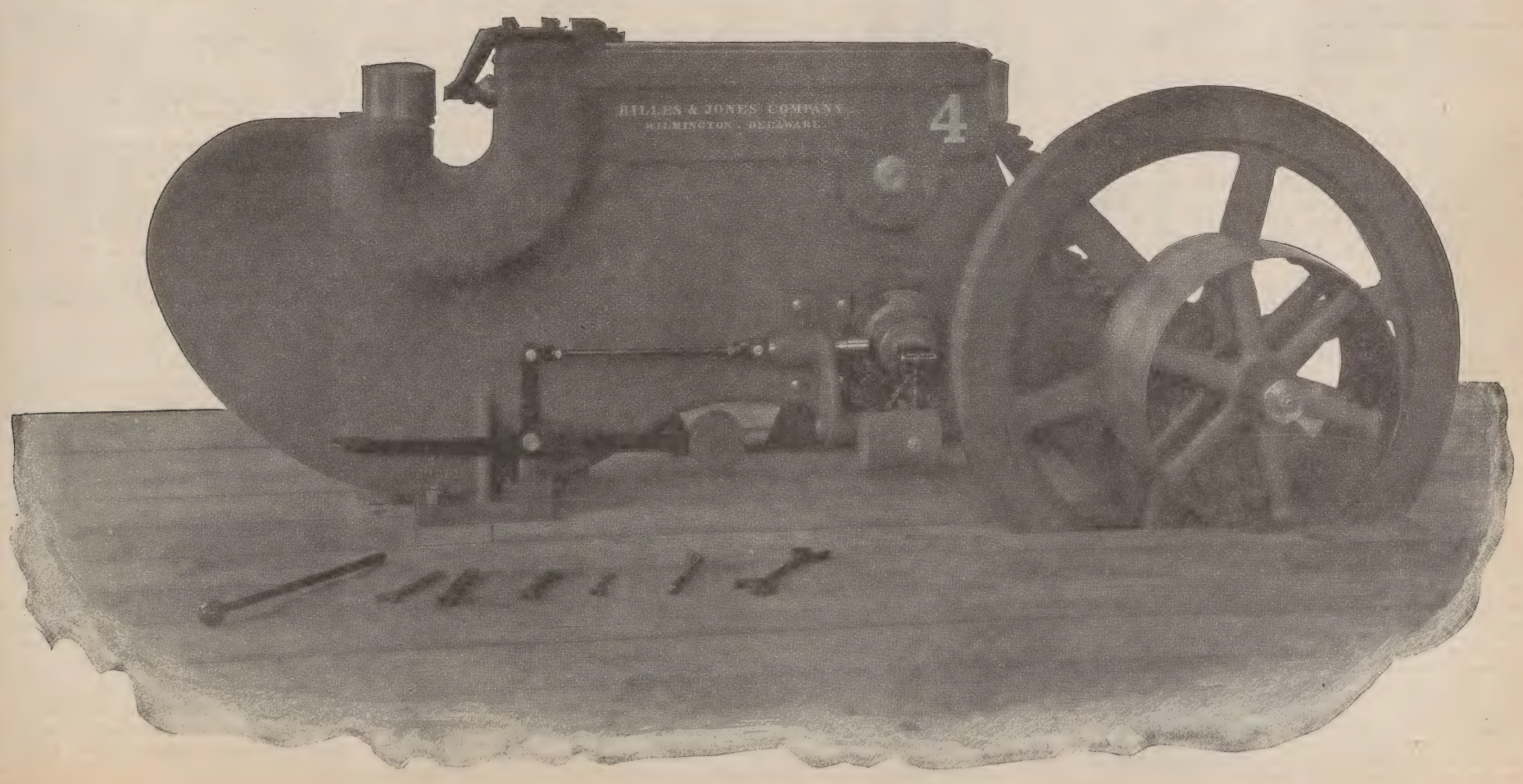
The Detroit Lubricator Company of Detroit, Mich., has just issued a very handsomely illustrated catalogue and price list of the locomotive appliances it manufactures and sells. As is generally well known, these consist of sight-feed lubricators for locomotive cylinders and air pumps, water-glasses and gaskets, rod and guide cups, metallic packing for piston and valve stem stuffing boxes (especially adapted for air-pumps), kerosene oil injectors for locomotives, and the well and favorably known "Garfield" injector for boiler feeding. This injector is easily operated, certain in action, and, having a wide range of possible adjustment of feed, is justly very popular with locomotive engineers.

Mr. William C. Baker. the well known maker of safety car heaters, has issued an illustrated pamphlet showing the improved forms of his heater, also the perfected safety vent, and water filling cock, used with these heaters.

Improved Horizontal Flange Punch.

The following engraving shows an improved horizontal flange punch that has a capacity for punching holes 1¼ inches in diameter in metal 1¼ inches thick. The machine is made by the Hilles & Jones Co., the well-known manufacturers of machine tools, of Wilmington, Del.

The main frame" is massive and self contained on the foundation so that no outboard bearings are needed. The clutch is worked by an improved adjustable automatic stop which will allow the sliding head to be stopped at any point in the stroke, thus making a heavy machine with capacity for severe duty, and yet equally available on light plates. The die is held in a forged steel stake which is keyed entirely through the nose, thus forming a most substantial support for it and at the same time allowing small diameters of pipes or bent flanges to be readily worked. The yoke lever which conveys the motion from the eccentric shaft to the sliding head is of cast steel and all of the parts are fitted up with careful reference to making a substantial and convenient machine throughout.

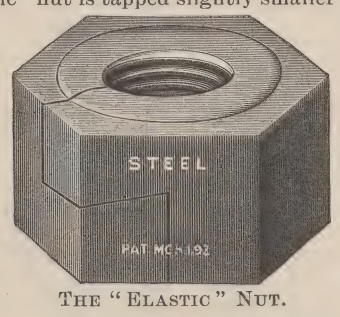


Improved Horizontal Flange Punch.

An Elastic Nut.

The engravings herewith show an improved form of nut, called the "Elastic" nut, and a bolt fitted with one of the same. It is made by the National Elastic Nut Company, of Milwaukee, Wis. Its purpose is to be self-locking and much more serviceable than the ordinary forms of nuts. A brief comparison of their manufacture will probably best show this. The common iron nut is stamped out of a flat bar of iron. The "Elastic" nut, however, is made of spring steel, being cut from a bar and then bent into a ring, the two ends coming around and joining in a dove tail split on one side, which is plainly shown in the cut. This ring is then pressed into the hexagon shape of a perfect nut. As thus made the grain of the metal runs around this nut, instead of through horizontally as in the common nut, adding increased strength and toughness.

The "Elastic" nut is tapped slightly smaller than the bolt,



THE "ELASTIC" NUT.

so that when the nut is put on with a wrench, it is distended a little and the split side opens slightly (about $\frac{1}{64}$ of an inch) developing a constant grip on the bolt. This grip is so strong and lasting that no amount of jar or vibration can start the nut in the least, and when once set up to place, it stays there absolutely rigid until again moved with a wrench. It is reported to have remained perfectly tight exactly where put on, under a vibration and strain that would break the bolt.

Another point in its favor deserving of mention is that on account of its elasticity, it can be put on and off repeatedly, over rust and battered screw threads on the bolt, that would prevent the use of the common nut. It can be used over and over again in this way, when removal is needed for repairs or change, and always hugs the bolt with the same powerful grip, thereby locking itself when again put on. This grip is always a tight clasp towards the center of the bolt, and puts no extra strain whatever endwise of the bolt or against the threads, therefore there is no wear.

The value of a perfect self-locking nut cannot well be overestimated, but the cost is said to be but a trifle over the common nut, and is less than the cost of the common nut together with a washer or nut-lock.

The "Yankee" Twist Drill Grinder.

The twist drill grinder shown herewith is made by Messrs. G. T. Eames & Co., of Kalamazoo. Mich., and is the result of much study and experiment. The want of a perfect drill grinder, cheap enough to meet all requirements, has long been felt. The emery wheel is of the cup form, and the drill is applied to it in such a manner that its perfect grinding does not depend at all upon a perfect wheel surface. Each time the drill is ground a new place on the wheel is used, which keeps it true and even.

There is no need of water with this machine, hence the operation of grinding is clean and convenient. It will grind all sizes of twist drills from $\frac{1}{8}$ of an inch to $2\frac{1}{4}$ inches, and can be set to any size in two seconds, and can be operated by any one. A drill ground on this machine has a helicoidal surface, and gives exactly the right clearance for drills of all diameters. The adjustment for drills of various diameters is obtained by an ingenious and very simple combination of angles in the sliding holder, and this is always right when the holder is adjusted to correspond to the diameter of the drill, which is ground to an angle of 59 degrees, which is the same as they are received from the factory. Our cut represents a 2-inch twist drill ready for grinding.

The Peerless Rubber Manufacturing Company, of 16 Warren street, New York City, has reorganized and elected the following as officers: President and General Manager, C. H. Dale; Treasurer, C. C. Miller; Secretary, Brown Caldwell. E. L. Perry is Superintendent, and H. W. d'Evers General Sales Agent. It is the intention of the company to double its present facilities for the manufacture of air-brake and steam-heating hose, packing and other rubber goods in which this company deals extensively, in order to meet the increasing demands of the railroad business.

Riehle Bros. Testing Machine Company, of Philadelphia, has issued an illustrated catalogue and general description of the improved automatic and autographic testing Machines and appliances as designed and constructed by it. This catalogue contains 122 pages, is printed on the finest quality of paper, and in the highest style of typographical art. The size is 9½ inches by 12 inches.

The Stewart Hartshorn Company, of East Newark, N. J., manufactures a special car roller which is pronounced by expert car builders to be the most substantial and satisfactory roller obtainable. This company's energies have been taxed to their utmost recently to fill orders on this particular class of goods, but we are informed that it is prepared to handle and ship orders for any amount or size in the shortest possible time. Catalogue and price list of these goods will be forwarded on application.

The Manhattan Furnace Company, of 612 Ashland Block, Chicago, has been organized with a capital stock of over $200,000 to extend the use of its smokeless furnace in that city. This furnace burns perfectly the ordinary forms of bituminous coal mined in the vicinity of Chicago. Experience has shown that fully 95 per cent. of the smoke usually formed can be eliminated by this device and the fuel saving has ranged from 10 to 30 per cent. This perfect admixture and combustion of the volatile gases is effected by the admission of the proper amount of oxygen and the forms of bridge wall and arches used, causing an intense smokeless flame to be generated in the flameway before reaching the tubes. These furnaces are constructed according to the designs of Mr. C. M. Higginson, of the Chicago, Burlington & Quincy Railroad, who, as is well known, has made a long study of the best methods of burning bituminous coal.

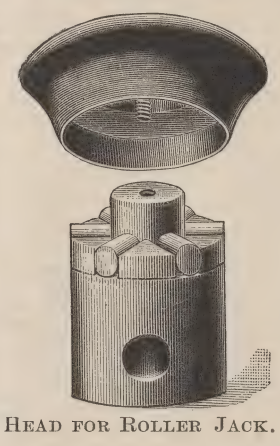
A Good Rod Packing.

The Quaker City Rubber Company, of 323 Market street, Philadelphia, has begun the manufacture of an improved form of stuffing box packing, called the "P. P. P. Diagonal Rod Packing." This packing is an arrangement of wedge-shaped rubber strips saturated with oil and plumbago and wrapped in muslin to keep it clean. It is made in lengths of 20 feet, and in all sizes up to and including $\frac{5}{8}$ inch; all sizes above $\frac{5}{8}$ inch is made in 12 feet lengths, and in all lengths it is twice as wide as it is thick.

It is impervious to the action of steam, oils, ocids alkalies and sulphurous waters. It works equally well on the heavy mining pumps and the most sensitive valve stems. On the steam hammer there is no indication of "drip" and it is not affected by the vibration of the rod. It is an absorbent of the lubricants, insuring a film of oil on the wearing surface and adapting itself to all conditions of the rod and all inequalities of the stuffing box, and is equally adapted for the hydraulic elevator or the air-pump. It is very pliable, hence quickly and easily applied.

Roller Jacks.

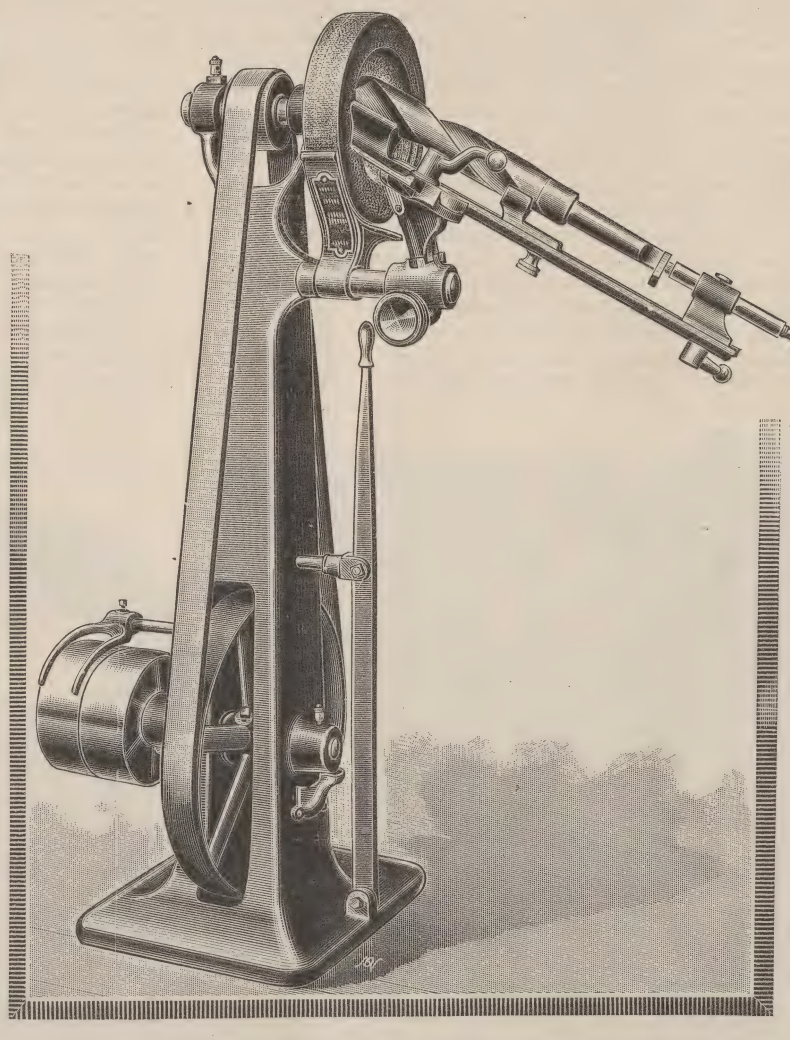
The accompaning illustration shows the head used in an excellent form of roller car-jacks made by the Millers Falls Co., of 93 Reade street, New York. These rollers will stand



HEAD FOR ROLLER JACK.

any load that the jack will carry, and are not liable to get out of order. They are a great improvement, and actual tests have shown that they effect a saving of 50 per cent. in power needed to lift a given weight.

The Bickford Drill & Tool Co., Cincinnati, has put on the market a new radial drill (called No. "G" Machine) for which it claims great superiority. The machine is an entirely new departure from the ordinary run of small radial drills, and possesses features which will recommend it very highly. For instance, a newly designed table the full length of the bed plate, an automatic stop for the spindle, and a new arrangement for throwing in and out the back gears. This machine will be illustrated in these columns in the near future. This company has also issued a book entitled "A Few Results," showing testimonials from the largest and leading manufacturers in the country about Bickford machines.



IMPROVED TWIST DRILL GRINDER.

"Fwin Oi kem over, in '68," said Mr. Grogan, "Oi was the only soul on board the ship." "Aw, what are you givin' us?" asked young Finnegan. "It is the trooth Oi am givin' yez. The rist av thim was all Orangemin and Dutch."

Above the headboard of Pat's bed was affixed on the wall a nondescript arrangement which quite resembled a small inverted saucepan, with hammer and spring attachment from which a piece of twine dangled to within convenient distance of the bolster. "What sort of an arrangement is that, Pat?" he was asked. "Sure, an' it's an alarum clock," he answered. "Does it work mechanically?" "In coorse it do, sor. It's devil a bit ov a t'ing Oi have ter do at all but pull the sthring an' it wakes me up in a juffy.

Improved Oil Cups for Locomotives.

The E. D. Bangs Oil Cup Company, Limited, of 718-28 Hanover street, Milwaukee, Wis., is engaged in the manufacture of highly improved automatic rod, excentric and crosshead cups for locomotives. These are made of aluminum, of one-third the weight and of greater tensile strength than brass. They will not break off. They distribute the oil evenly, a small particle at each stroke of the crank, eccentric and cross-head. The cup is positive in its feed and cannot be stopped up by sediment. No filtering of the oil is necessary, and no oil is wasted while the engine is idle, as it feeds from the top, being thrown up by the reciprocal motion of the engine and directed to the feed hole by a spoon-shaped "oil guide." Another feature is an extension stem, which carries the oil direct to the pin. These cups are in use on the Central Railroad, of New Jersey; N. Y., L. E. & W.; C. N. W.; Soo Line, etc., etc.

They are also becoming popular in marine service, the *Paris*, of the American Line, being equipped with them, and orders being given for the like equipment of the *New York*, and the new ships *St. Louis* and *St. Paul*.

Messrs. William Sellers & Co., of Philadelphia, are constructing 10 electric traveling cranes for the Bethlehem Iron Company. These cranes range in capacity from 5 to 75 tons. In addition three 10-ton electric traveling cranes are being built for the Westinghouse Electric and Manufacturing Company, of Pittsburgh.

"I can't tell you," said the experienced suburbanite, in reply to the question of his new neighbor, "when the next train goes, but I can tell you what your chances of catching it are." "What are they?" inquired the new neighbor eagerly. "Well, if you run as hard as you can," said the experienced resident, "you'll have fifteen minutes to wait, and if you merely walk you'll find the train just pulling out."

The British Vice Consul at Buenos Ayres, in a report to his Government, calls attention to the great importance of foreign manufacturers registering their trade-marks in the Argentine Republic at the earliest opportunity. He states that, with many local industries and imports from all countries, the first person to register a trade-mark in the republic obtains the exclusive right to it and may bring action against importers of goods with similar marks.

Referring to a report that the Great Northern Railroad was anxious to extend free transportation to all U. S. Mail agents, President Hill, of that road, says: "I have made no such offer whatever. When the United States Government becomes bankrupt, with its unconstitutional income tax laws, etc., and passes around the hat for financial assistance, why, I shall be pleased to 'chip in.' As matters now stand, the mails are being carried for less than is paid for the transportation of coal."

Our Directory.

OF OFFICIAL CHANGES IN APRIL.

We note the following changes of officers since our last issue. Information relative to such changes is solicited.

Atchison, Topeka & Santa Fe.—General Purchasing Agent W. G. Fuller has resigned, and is succeeded by W. G. Nevin.

Atlantic & Danville.—General Manager G. M. Hughes has resigned.

Central Railroad of Georgia.—Master Mechanic Frank H. McGee has resigned, and is succeeded by John Dempsey.

Chicago & Northern Pacific.—A. L. Hopkins is appointed sole receiver.

Cincinnati, Hamilton & Dayton.—A. J. Ball is appointed Master Mechanic, with office at Dayton, O.

Everett & Monte Cristo.—General Manager J. T. McBride has resigned.

Hoosic Tunnel & Welmington.—J. M. Hale is appointed Master Mechanic at Readsborro, Vt.

Kansas City Ft. Scott & Gulf.—Superintendent of Motive Power and Machinery J. S. McCrum has resigned, and is succeeded by Wm. A. Nettleton.

Louisville & Nashville.—W. S. Martin is appointed Superintendent of the Louisville division, vice W. P. Pike, deceased.

Middlesborough Belt.—Receiver J. A. Bartlett has resigned and J. W. Logsdon is appointed Superintendent.

Minneapolis, St. Paul & Sault Ste. Marie.—Purchasing Agent W. Watkins has resigned, and is succeeded by T. A. Switz.

Minneapolis Union.—E. B. Wakeman is appointed Superintendent.

Missouri Southern.—General Superintendent P. E. Wilson is made General Manager, office at Leeper, Mo.

Mobile & Ohio.—Assistant General Manager John G. Mann is made General Manager.

New York and New England.—J. N. King; Superintendent of the Central division, has had his jurisdiction extended over the Norwich and Worcester division, with office at providence, R. I.

New York, New Haven & Hartford.—Superintendent of Car Department W. H. Fry, has resigned, and jurisdiction of Superintendent of Motive Power John Henney, Jr., is extended over car department.

Ohio River.—Geo. A. Bart is elected General Manager.

Pennsylvania.—H. W. Byers has been appointed Superintendent of the Erie & Ashtabula Division, vice Mr. Kimball, transferred. Office at Lawrence Junction, Pa.

Philadelphia, Reading & New England.—Master Mechanic E. M. Humstone is appointed Assistant Superintendent.

Richmond & Danville.—Master Mechanic W. A. Brown has resigned and is succeeded by M. M. Reid.

Santa Fe, Prescott & Phœnix.—W. L. Wallace is appointed Superintendent of Motive Power, Machinery and Rolling Stock, office Prescott, Ariz.

Seaboard Air Line.—Master Mechanic S. B. Shaw, of Raleigh, N. C., has resigned.

Southern Pacific.—Superintendent Agler of the Truckee division, is transferred to the Ogden division, with office at Ogden. The jurisdiction of Superintendent J. B. Wright of the Sacramento division is extended over the Truckee division.

Southern Railway.—W. H. Green is made General Manager, C. H. Hudson is made Chief Engineer, and J. S. B Thompson is appointed Assistant General Superintendent.

Wagner Palace Car Company—Thos. A. Bissell, Manager Buffalo Works, has resigned and is succeeded by E. A. Benson.

Employment.

A car builder, experience in railroad car department and shop management, and able to give highest references as to ability, etc., is open for an engagement with a railroad or private car-building company. Address CAR BUILDER, care of NATIONAL CAR AND LOCOMOTIVE BUILDER.

FOR SALE.—A patent, covering new improvements in car construction, that can be used to advantage by every railroad; Patent issued December, 1894. Address CAR CONSTRUCTION, care NATIONAL CAR AND LOCOMOTIVE BUILDER.

JUN 8 1895 U.S. PATENT OFFICE

NATIONAL CAR AND LOCOMOTIVE BUILDER

JUNE, 1895.

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The Boston & Albany has ordered 12 passenger cars of the Pullman Company.

The Davenport, Clinton & Eastern will order some cars and locomotives in July.

The Southern Railway has ordered nine locomotives of the Baldwin Locomotive Works.

The Texas Pacific has ordered 300 box cars of the Missouri Car and Foundry Company.

The Georgetown & Trinity has ordered 12 locomotives of the Pittsburg Locomotive Works.

It is said that the Ohio River Railroad Company will build new shops at Central City, W. Va.

It is said that the Lenoir Works has sufficient orders on hand to keep it running till January next.

The Mahoning Ore Company has placed an order with the Pittsburg Locomotive Works for one engine.

The Manchester Locomotive Works are building six six-wheel switch engines for the Boston & Maine.

The Pittsburg & Lake Erie has ordered six 10-wheel freight engines of the Pittsburg Locomotive Works.

The Southern Railway has ordered 20 passenger and four baggage and express cars of the Pullman Company.

The tenth annual convention of the Order of Railway Telegraphers was held in St. Louis beginning May 20.

The Mississippi River & Bonne Terre Railroad has ordered 100 dump cars from the St. Charles Car Company.

The Toledo, St. Louis & Kansas City Railroad will be in the market in a short time for between 300 and 500 freight cars.

The Duluth & Iron Range Railroad has ordered four freight locomotives from the Schenectady Locomotive Works.

The San Francisco & San Joaquin Valley Railroad is said to be in the market for a number of cars and three locomotives.

A two-cylinder compound consolidation freight engine is being built at the Altoona shops of the Pennsylvania Railroad.

A narrow gage road 174 miles long is to be built to connect Assouan, Egypt, with the present terminus of the Upper Egypt Railroad.

The Union Car Company has just received an order for 200 Wickes refrigerator cars from the Merchants' Despatch Transportation Company.

The Missouri, Kansas & Texas has placed an order with the Illinois Steel Company, Chicago, for 8,000 tons of 66 and 75-pound steel rails.

The receivers of the Chesapeake, Ohio & Southwestern have been authorized to purchase 3,000 tons of steel rails for relaying a part of the road.

The South Baltimore Car Works, of Baltimore, Md., have been awarded a contract to build 200 coal cars for the West Fairmount Coal & Coke Company.

The South Chicago Works of the Illinois Steel Company have been rolling some 85-pound rail for the Pennsylvania lines which is to be in 60 feet lengths.

The Grand Rapids & Indiana Railroad is negotiating for the purchase of six new locomotives, specifications for which have been out for some time.

The new shops of the Louisville, New Albany & Chicago, at Lafayette, Ind., will, it is announced, be ready for occupancy by the middle of June.

Detail drawings are being prepared at the Schenectady Locomotive Works for several eight-wheel passenger engines for the Chicago & Northwestern.

The Jacob Dold Packing Company, of Kansas City, has placed an order with the Missouri Car & Foundry Company, of St. Louis, for 100 refrigerator cars.

The Lima Locomotive & Machine Company has recently completed a 28-ton Shea locomotive for use on the Salt Lake & Mercur Railroad, a mining railroad in Utah.

The Boston & Maine has prepared specifications for 600 new cars and is now asking bids for the cars. The order will include 200 box cars, 200 platform cars and 200 coal cars.

The Toledo, Ann Arbor & North Michigan order, which is to be for 500 box cars, is still being delayed by the failure of the receivers to secure the necessary authority from the court.

The Atlantic & North Carolina Railroad has received from the Richmond Locomotive Works two new passenger engines for fast service between Goldsboro and Morehead City, N. C.

The Cleveland, Cincinnati, Chicago & St. Louis has recently asked bids for three new postal cars to be 60 feet in length. They will be lighted by Pintsch gas and have steam heat.

The New York Central has completed arrangements with the Canadian Pacific and the Duluth, South Shore & Atlantic Railroads which will give it a direct road to Duluth, Minn.

The Columbus, Hocking Valley & Toledo has closed a contract with the Pullman Car Company for building 900 coal cars of 30 tons capacity. The amount of the contract is said to be about $200,000.

The Columbus shops of the Pennsylvania are now building a number of new passenger cars for the St. Louis Limited and for two other fast passenger trains running over the Pan-Handle route.

The Cleveland, Cincinnati, Chicago & St. Louis has placed an order for 300 stock cars with the Indiana Car & Foundry Company. It has also ordered four passenger cars of the Pullman Company.

Beginning May 12, the Wabash railroad sends its Chicago fast day train and its New York and Boston fast night train from St. Louis over the Merchants' bridge and the Elevated line, avoiding the tunnel.

The Haskell & Barker Car Company, of Michigan City, Ind., is building 10 extra large box cars for the Menasha Wooden Ware Company. The cars are to be equipped with air-brakes and vertical plane couplers.

The Philadelphia & Reading is in the market for 1,000 new coal cars of 60,000 pounds capacity. The specifications call for Westinghouse air brakes, Gould couplers, Scott springs, Ajax journal bearings, etc.

The Memphis Car & Foundry Company has closed a contract with the Southern Railway for 200 40-foot furniture cars. It is also building a number of tank cars for the Davenport Syrup Refining Company, of Davenport, Ia.

The Baldwin Locomotive Works has received a number of small orders, including engines for the Kansas City, Osceola and Southern Railroad of Missouri; 10-wheel engines for the Central Vermont, and a six-wheel connected engine for the Union Terminal road at Kansas City.

The Louisville & Nashville has given out an order for 950 freight cars divided between the Mt. Vernon Car Company, of Mt. Vernon, Ill., and the Elliott Car Company, of Gadsden, Ala. The Mt. Vernon order includes 250 box and 400 gondola cars, and that of the Elliott Company 250 box and 50 ore cars.

A new railway line has now been commenced in Siam. Commencing at the Siamese seaport town of Alor Star, the line will proceed some 80 miles in a northeast direction to its terminus at Singorah, on the Gulf of Siam. When this section is finished, a southerly extension is to be commenced, which will finally be extended to Perak.

As showing that times are improving in England, the Manchester, Sheffield & Lincolnshire Railway Company has given an order to Messrs. Beyer, Peacock & Company, of Gorton, Manchester, for 76 locomotives of an improved type. The railway company is now building 50 locomotives of the same type at its own shops at Gorton.

Messrs. Poulterer & Co., of Philadelphia, have recently shipped a 40-ton locomotive to the Pittston Hard Rock Phosphate Company, of Florida, also one each to the Condon-Lane Boom Company, of West Virginia, and the Dry Fork Railroad Company. The company also has an order for two more locomotives to be sent to Florida in a short time.

The Atlanta & West Point has ordered three first-class passenger coaches of the St. Charles Car Works. The specifications for these cars call for Westinghouse air-brakes, National hollow brake beams, Janney couplers, quadruple five-ply elliptic springs, Pintsch gas, standard Baker heater in connection with steam heat, and quartered oak interior finish.

Among the number of Buffalo, Rochester & Pittsburg engines being rebuilt by the Brooks Locomotive Works, as announced in our last issue, there are some 17-inch by 26-inch eight-wheel passenger engines, 20-inch by 24-inch consolidations, and 19-inch by 24-inch moguls. They are generally having new boilers, cylinders, cabs and tenders, making practically a new engine of each.

The Missouri, Kansas & Texas order for 2,100 freight cars, which has been hanging fire for about four months, has been finally placed. The Madison Car Company secured 1,300 of the cars, the order including 700 furniture and 600 coal cars. The Missouri Car & Foundry Company was awarded 800 box cars. It is understood that an order for passenger cars will soon be given out by the company.

The Haskell & Barker Car Works, of Michigan City, are now building 100 cars for the Parry Manufacturing Company, Indianapolis, all of which will be delivered within 30 days. The cars are 50 feet in length, 9 feet high, and 8½ feet wide on the inside, and are equipped with air-brakes, automatic couplers. The cars will present a novel appearance, as they will be painted black, with gold-leaf lettering, and on either side a full-sized buggy will be painted. The Parry Manufacturing Company expects to ship most of its production in these cars.

The Missouri, Kansas & Texas has ordered five mogul and four consolidation locomotives of the Baldwin Locomotive Works, five moguls of the Brooks Locomotive Works, and four from the Richmond Locomotive Works. The company is to contract for 26 locomotives altogether, and the orders for the remaining nine will soon be placed. The moguls have 19-inch by 24-inch cylinders and 56-inch driving wheels, with 4,000-gallon tanks. The consolidations have 21-inch by 26-inch cylinders, 56-inch driving wheels, and 4,300-gallon tanks.

The Louisville & Nashville Railroad has ordered ten consolidation and five 10-wheel passenger locomotives from the Rogers Locomotive Works. The consolidation engines are to have 20 by 26-inch cylinders, 48-inch driving wheel centers, with Krupp, Midvale or Latrobe tires, 3½ inches thick; Monitor injectors; Nathan lubricators; United States metallic packing; Ajax metal on wearing surfaces of crossheads and driving boxes; Margach balanced valves with Leeds' improvement; Westinghouse brake equipment and Ross-Meehan brake shoes. The 10-wheel passenger engines are to have 19½ by 26-inch cylinders, 67-inch driving wheels with Krupp tires.

The Live Poultry Transportation Company, which has offices in the Rookery Building, Chicago, has recently let a contract to the Ohio Falls Car Company, for 38 cars. These cars will have a capacity of 16,000 pounds each, that is, from 4,000 to 5,000 head of poultry. The cars are 34 feet 10 inches long inside. This company has 150 of these poultry cars in service. They are without air-brakes or vertical plane couplers, and it is said that the new cars are to be minus these improvements. Evidently the company is in the business for what it is worth. Some society for the prevention of cruelty ought to take it in hand. It would probably order a few more cars then, as penning several thousand chickens or other fowls in one car is as cruel as anything can well be, and probably quite as bad for the public health as any other kind of indiscretion practiced by greedy shippers.

Adding Larger Boilers to Old Locomotives.

On page 39 of our issue for March we published an article under the above heading descriptive of the plan followed on the Intercolonial Railway in rebuilding old engines and adding the larger and heavier boilers that experience taught were necessary for efficient and economical operating. Those of our readers who have struggled with the problem of how to make the old frames safely support the increased weight, or those who expect to have to meet that problem, should refer to our previous article and its illustrations, and to the letter accompanying the same from Mr. Francis R. F. Brown, the Mechanical Superintendent of the road. Mr. Brown favors us in this issue with some further drawings, illustrating his method of strengthening the frames, and a letter explaining the same and describing the exceedingly strong boiler adopted, drawings of which are also submitted. The following is Mr. Brown's letter:

Editor National Car and Locomotive Builder:

In my first letter I aimed at taking up as little of your space as possible, but have now at your request somewhat enlarged.

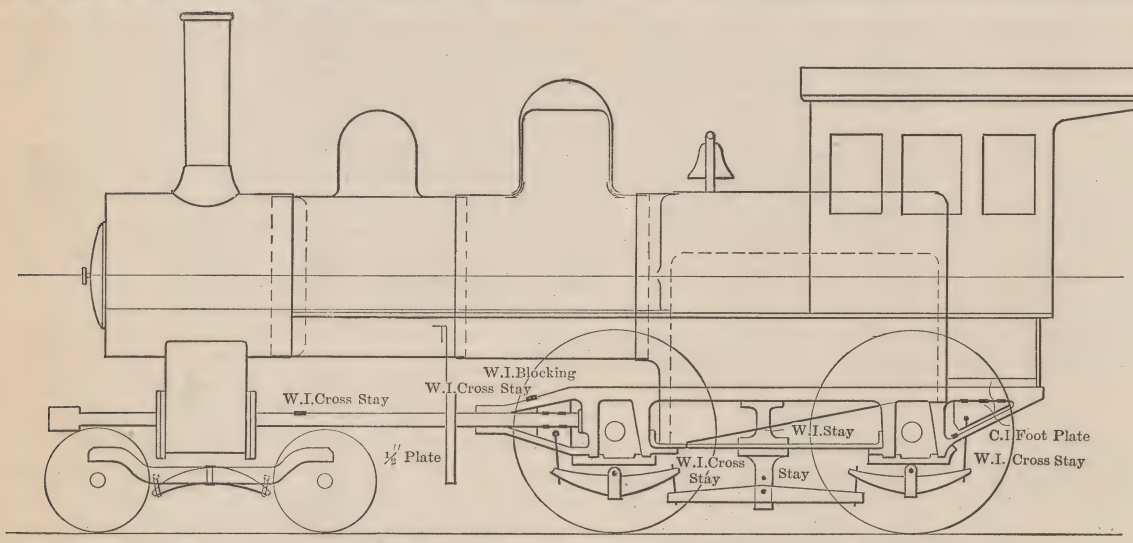
Attention is more particularly drawn in the rebuilt engine to the stiffening at the motion plate; splice of main frame with front extension; the wrought iron stay in the back panel of frame, and the back casting. At this latter part, the back end of the frame, where there is such a great tendency to loosen the connections between the back casting and the frame, it was deemed advisable to have special extra rigidity combined with extra weight on the back drivers. The ordinary method of through bolting, either vertically or horizontally, is a constant source of trouble, by working loose in time, even with good fitting at the start, when the engine has heavy work to do, and especially so when there is a small overhang, as in this case.

The drawings show the form of the casting adopted, with the method of securing it. It will be noticed that the casting is made to grip the top and under side of the top bar of the frame; and three wrought iron keys grooved into the frame and casting take the whole thrust and pull.

The frames are bound together on top by two wrought iron stays 3½ inches by 1 inch with strong lug, fitted on with a slight shrinkage, and bolted through the frame. The vertical and horizontal bolts further secure the casting. This casting weighs some 3,000 pounds. The lower part of the casting is wedged and bolted to the diagonal lower part of the frame, and also forms a suitable place for attaching the back spring hanger; the pin of this hanger working in an iron bushing.

The boiler as shown is of the Belpaire type and has a total heating surface of 1,170 square feet, with a fire grate area of 22 square feet. The tubes are somewhat shorter than usual, the distance between the tube sheets being 10 feet 6 inches. There are 192 tubes 2 inches outside diameter, giving a heating surface of 1,050 square feet. The first boiler was fitted with "Serve's" ribbed tubes for trial and has 134 tubes of 2½ inches outside diameter. The shortening of the boiler barrel reduces the weight on the truck, and in practice the length of tube adopted has been found ample, the boilers steaming very freely and using less coal for the same amount of work than the old boilers did. This is no doubt owing principally to the increased grate area of 5½ square feet in excess of the old boilers, which allows easy firing; while the tube heating surface which is taken off, as compared with the old boilers, is more than compensated for by the additional and more effective heating surface added to the new firebox.

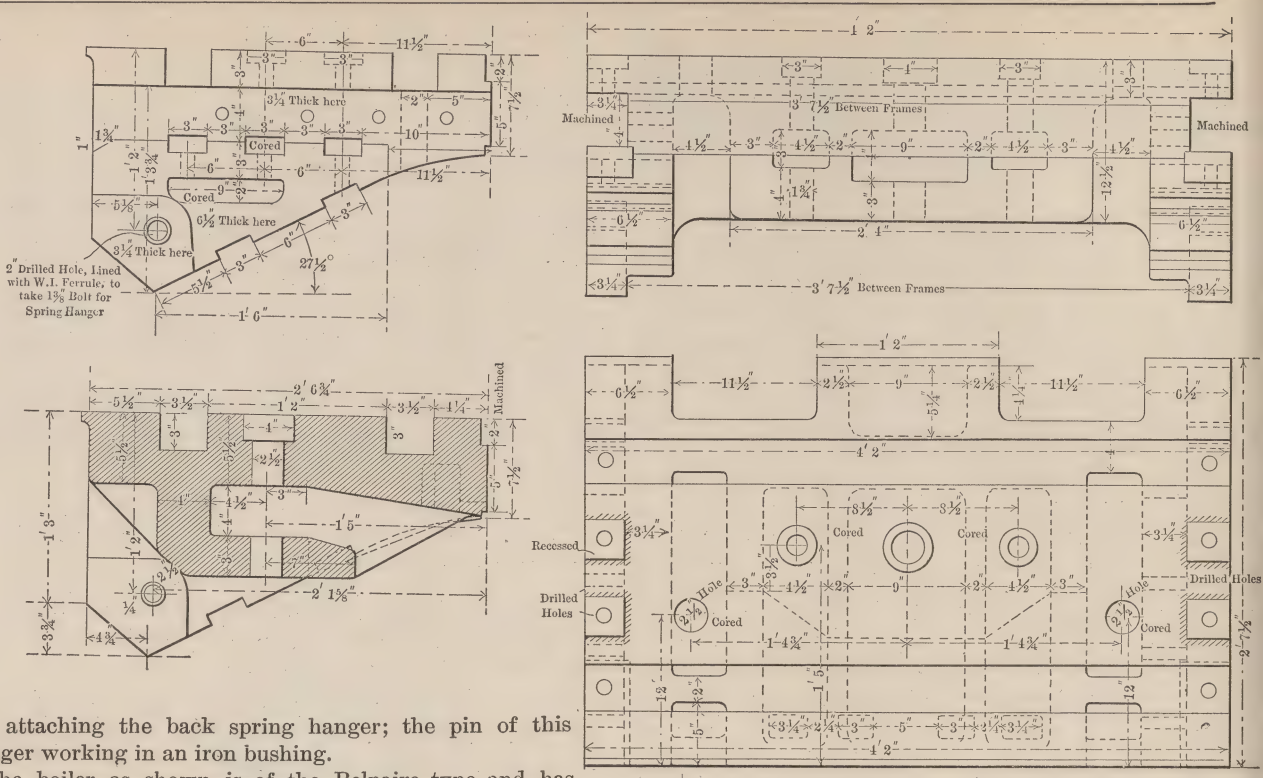
The cylinders, being well forward of the tube sheet, allow the baffle plate of extended front to be arranged behind the exhaust pipe, with ample capacity behind it.

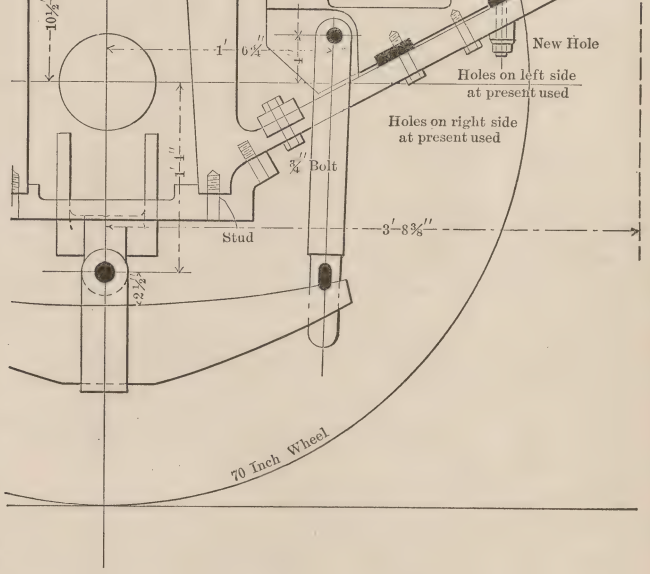


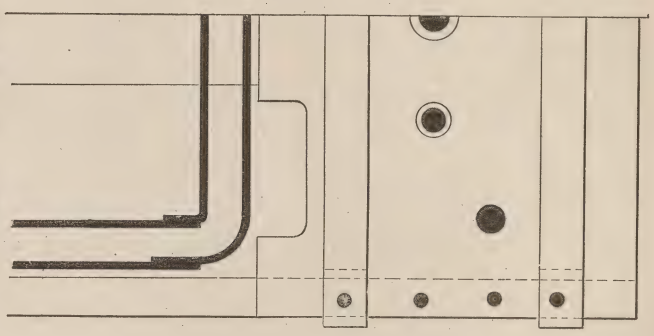
Rebuilt Engine, Intercolonial Railway.

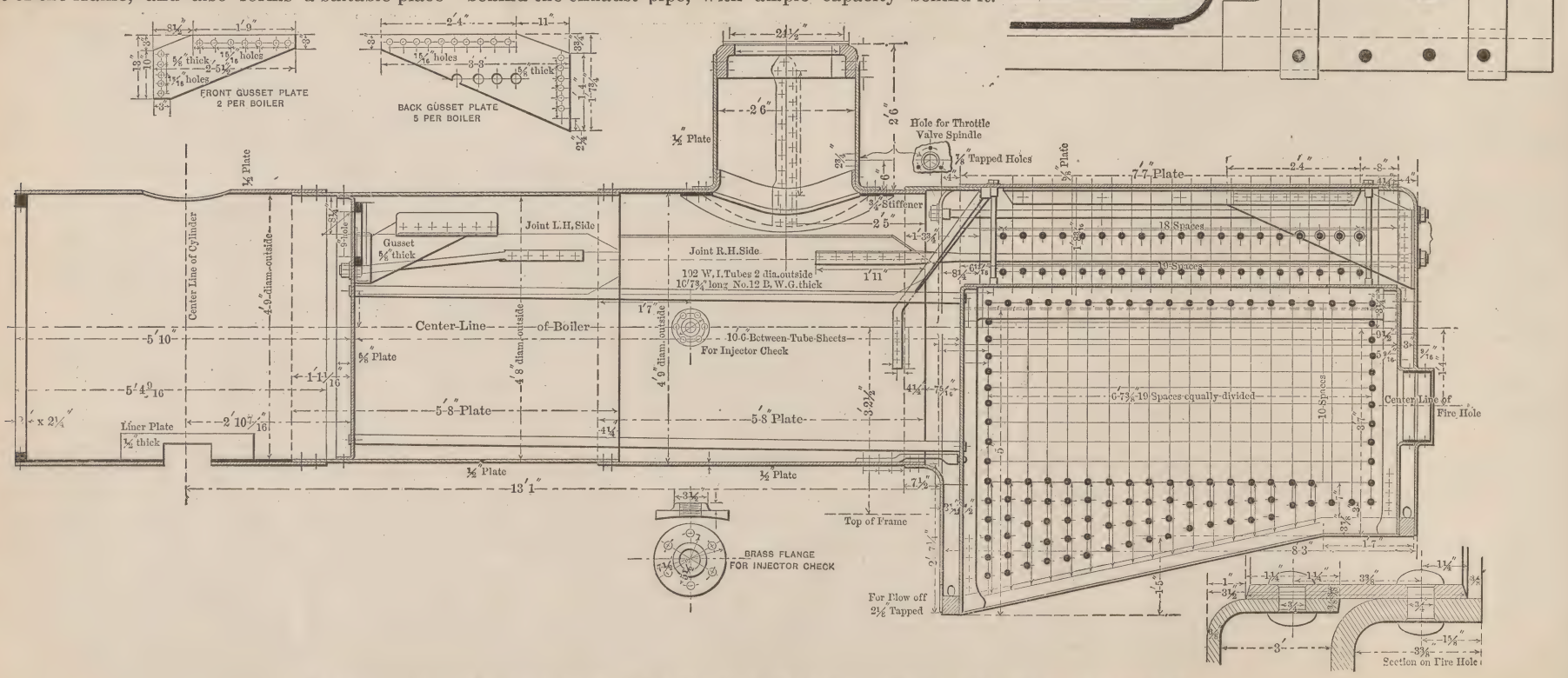
General Dimensions—Cylinders, 18 × 24 in.; 70-in. drivers, Belpaire boiler, 56 in. diameter, 22 sq. ft. of grate surface, 180 lbs. pressure.

Replacing Engines with same size cylinders, 69-in. drivers, wagon-top boiler, 52 in. in diameter, 16.5 sq. ft. of grate surface, 140 lbs. pressure, ordinary bar frames, upper-hung springs.









BELPAIRE BOILER FOR REBUILT ENGINES, INTERCOLONIAL RAILWAY OF CANADA.

This has been found to give good results, and gives easy access to pipe joints, etc., in the smokebox.

The boiler barrel is 56 inches outside diameter at smaller course, and is made in two courses of ½-inch plating, each course being in one sheet, as also is the extended smokebox. Both longitudinal and circumferential seams of the barrel are double riveted, the longitudinal seams being butt joints with double welts. The whole of the plating used in the construction of these boilers is of Scotch steel of the best firebox quality. The dome is 30 inches outside diameter by 30 inches high, and is made of one ½-inch plate with a double-riveted vertical lap joint. In position, it has been kept as near over the front driving-wheels as the throat-sheet seams would allow. The boiler barrel at the dome is stiffened by being flanged up inside of the dome, and also has a ⅝-inch stiffening plate inside, triple-riveted.

The firebox is 8 feet 3 inches long by 3 feet 6⅜ inches wide outside at foundation ring, and widens out at the Belpaire crown to 5 feet ⅜ inches outside. In order to get at the grate area the foundation ring is inclined and extended over the back driving axle; this also gives a part of the desired additional weight on the back drivers. The throat sheet is flanged out of one plate $\frac{9}{16}$ inch thick, and forms a nearly flush top with the outside crown sheet. The face plate is flanged out of a $\frac{9}{16}$ inch plate, the fire hole being formed with a sleeve as shown.

The outside side and crown sheets of the firebox meet in a lap joint 14 inches wide at the sides. This lap takes the 38 crossstays 1⅛ inches diameter, which holds the sides together above the inside box. An additional stiffening plate is also added inside, taking the lower row of 1⅛-inch crossstays, and the top row of the side through screwed stays. The throat and face plates are stiffened with four 1⅛-inch through stays, two of these nutted at both ends and two with rivets on face plate, and riveted to the boiler sheet at the other end.

The crown and crossstays are all reduced at the middle part between the threadings; and no welding was allowed in any of the stays, all the ends being upset, or the center portion swaged down. The crown stays are 1⅛ inch screwed at ends, put in from the inside and nutted with a copper washer on the top outside. The first row of these stays is placed 6¼ inches from the tube sheet. Previous experience with stays so placed on a Belpaire boiler seems to show that this gives sufficient pliability without resorting to any special stayings to allow for tube sheet expansion.

The side and end stays of the firebox are all one-inch diameter except the top row of side screwed stays, which are 1⅛ inch diameter. A 2-inch by 1½-inch stay from the crown sheet to the barrel course takes off the crown stays some of the stress due to steam pressure. The outside crown sheet is further stiffened by half-inch bent plates running lengthwise. These are riveted together and to the crown sheet, and take the crown stays. They also form an angle for the back gusset plates. All the stays except the gusset plates are made of Lowmoor iron. The front tube-sheet is stiffened with a 2¼ by 1¼ wrought-iron ring at the dry pipe hole, and with gussets and palm stays as shown.

The thicknesses of the inside firebox plating are: sides $\frac{5}{16}$ inch thick, back and crown ⅜ inch thick, tube sheet ½ inch thick. The foundation ring is 3⅞ inch deep, double riveted. The water spaces in the leg are 3 inches, except at front, which is 3½ inches. The weight of the boilers empty, with all tubes in, is 25,000 pounds each. The working pressure is 180 pounds per square inch, and the boilers were tested under water pressure to 270 lbs. per square inch. Yours faithfully,

FRANCIS R. F. BROWN,
Mechanical Superintendent.

MONCTON, N. B., May 21.

The Wood of Most Uses.

Theoretically speaking, says *Timber*, of London, Eng., the oak is the wood which can be put to the greatest variety of uses, but, as a matter of fact, the pine is most used on account of its abundance. The timber of the oak, which combines in itself the essential elements of strength and durability, hardness and elasticity in a degree which no other tree can boast, has been used as a material for shipbuilding since the time of King Alfred. It is also employed in architecture, cabinetmaking, carving, mill work, coopering and a thousand and one other ways, while the bark is of great value as furnishing tan and yielding a bitter extract in continual demand for medicinal purposes.

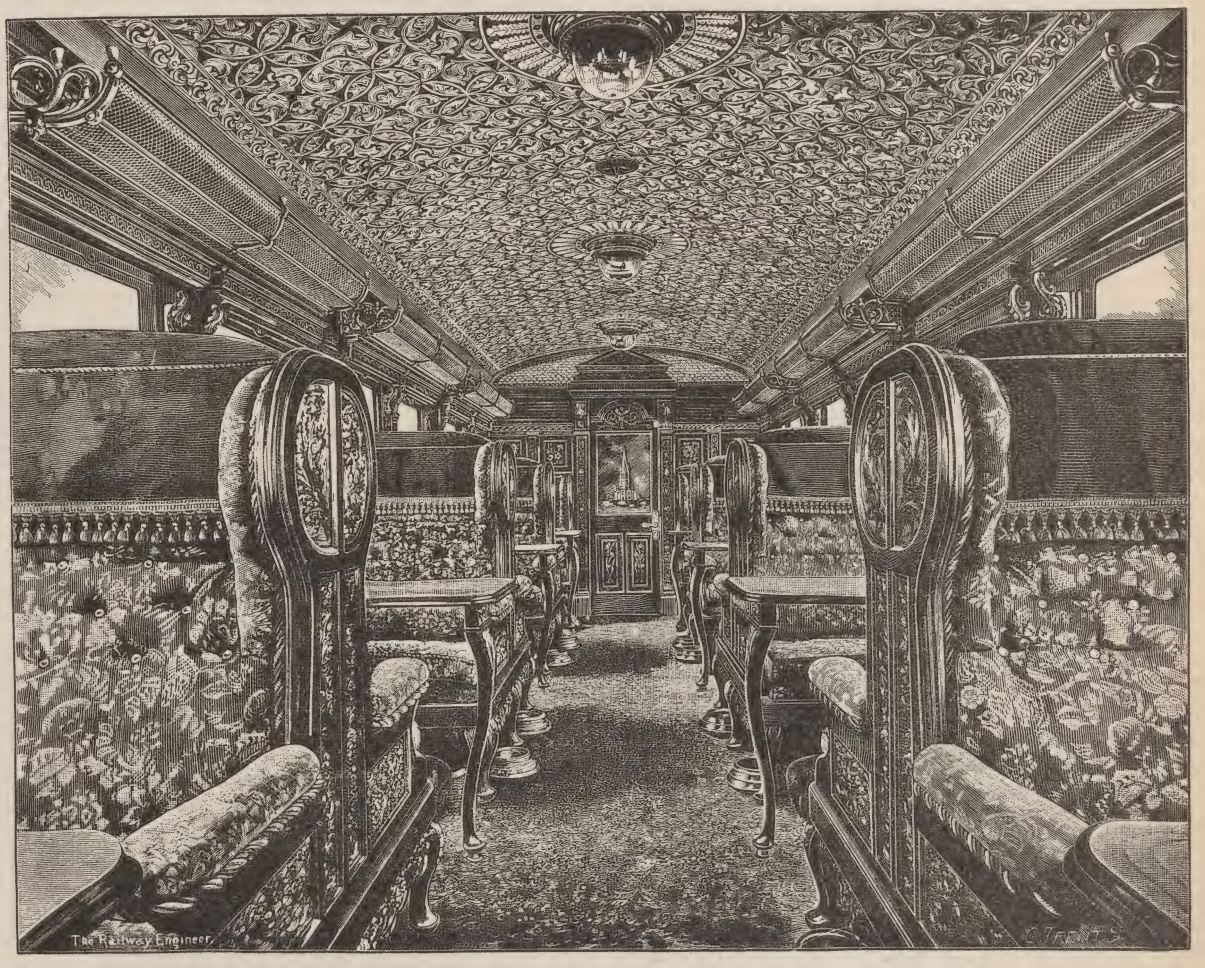
The timber of the pine is also used in house and ship carpentry. Common turpentine is extracted from it, and much tar, pitch, resin and lampblack. Splinters of the resinous roots serve the Highlanders instead of candles. Fishermen make ropes of the inner bark which the Kamchatdales and Laplanders steep in water and utilize for making a coarse kind of bread. The oil obtained from the shoots of the dwarf pine is a kind of universal medicine among the peasants of Hungary, while the soft grained silver fir is in much requisition for the sounding boards of musical instruments, and the Germans employ it almost exclusively in their vast toy factories. In the manufacture of lucifer matches, and, above all, paper pulp, thousands and tens of thousands of acres of pine forests are cut down every year, and the timber, constituting the chief material of English and American builders, is more used than all other kinds of wood put together.

First-class Scotch-English Dining Saloon.

The accompanying illustration gives an interior view of one of the first-class dining saloons of the East Coast Joint Stock Railway. With the exception of royal and other special vehicles, these saloons are perhaps the most luxuriously furnished of any in Great Britain. They were built by the Lancaster Carriage and Wagon Company, to the designs of Mr. Wilson Worsdell, Locomotive, Carriage and Wagon Superintendent of the North Eastern Railway, and are in service on the through trains between London and Edinburgh. Our engraving is reproduced from the last issue of our English contemporary, the *Railway Engineer*, and the descriptive matter is taken from the same source.

The cars are 46 feet long, 8 feet 3 inches wide and 7 feet 6 inches high inside of the middle. The body is divided into four compartments, two saloons and two vestibules, the former being 26 feet 8 inches and 13 feet 4 inches long respectively, and the vestibules being 2 feet 6 inches long. The under-frame is made of teak, the side-sills being supplemented by ½-inch steel angle plates. Truss rods 1¼ inches in diameter are used, coupled by turnbuckles, or, as our English friends say, "stretching nuts," made of the best Yorkshire iron. The whole of the upper framing, outside panels and moulding is of teak. The framing is bound together with strong wrought iron knees, and further secured by ⅝-inch teak pins. The end battens are half lapped and screwed together at each joint with screws, 2 inches long. The panels are full ⅝ inch thick, backed with canvas, well glued and thoroughly dried before being put in, and when fixed were blocked and painted on the inside with three coats of teak colored white lead. The panels are well secured with brass panel pins, all the exterior joints covered with teak mouldings 1 inch by ⅝ inch, and are painted with teak colored white lead on the back before being secured with 1¼-inch copper pins. The floor boards are 1⅛ inches thick, of the best St. Petersburg table is attached to the side of carriage with two nickel-plated hooks, engaging into nickel-plated eyes, and supported on the outside by a carved leg attached by two strong brass hinges; a wrought iron spike with india-rubber washer is fixed to the bottom of the foot and fits into a brass washer screwed to the floor. The windows lift upward, and are held in position with suitable nickel-plated attachments. The parcel racks have bronze brackets and copper netting, and the hat brackets are nickel-plated. The roof and ends above moldings are covered with Lincrusta, with white flowers on gold ground, mounted on millboard, and the joint at the ends and sides is covered with a gilt molding. The floor is covered with the best Wilton carpet laid on felt. Hassocks covered with the same carpet are provided for each seat, and also spittoons of suitable material. The end doors are fitted with beautiful and most expensive glass panels. The one shown in the illustration has a fine view of Durham Cathedral on it.

The cushions forming the backs and head-rests are trimmed on loose frames so that they can be easily removed, and have strong canvas on one side, and gray calico and special rose-colored figured moquette on the other, well stuffed and closely tufted. The buttons are covered with morocco, finished with a ⅝-inch twisted silk cord, and a velvet over-trimming to hang loose from the top; the bottom is fringed. One electric communicator to tell tale in pantry is fixed at each table.



Scotch-English Dining Car.

deal, tongued and grooved, to run longitudinally, and secured by screws 2½ inches long.

Wrought iron corner plates and brass chequer sill plates, end ascending steps, handrails, and lamp irons and recessed india-rubber blocks between the body and the underframe are fitted in the usual manner. The roof boards are of the best pitch pine, ⅞ inch thick finished, tongued and grooved, and fixed to the roof sticks with screws 1⅝ inches long. The roof is supported by channel irons. The framings, panels and moldings are of walnut, French polished; the doors hung by three nickel hinges, the framing and moldings of walnut, carved panel on top with three special marquetry walnut panels. Both sides of door in the same style. Door handles, inside are of ivory and outside of ebony, stand central when shut; the catch disengages with upward or downward movement, and the fittings are nickel-plated. The door in the center of the saloon is of walnut, with large figured plate glass panel in the center. Umbrella stands are provided. The moldings and framework, ventilating slides, face pieces, window frames, pillars and framework of seats are of walnut, French polished; and the ends of seats are fitted with carved panels and carved feet.

The tables are of mahogany ¾ inch thick, with polished moldings projecting $\frac{3}{16}$ inch. The top of tables are covered with leather, having a stamped border; each

Metric System of Weights and Measures.

The use of the metric system of weights and measures is now practically universal in scientific investigations, and is slowly being introduced among manufacturing establishments making machinery for export to South American countries where the system is employed. There are a number of societies in this country and England which are endeavoring to have it adopted for ordinary purposes by English-speaking people, but their efforts have not met with much success as yet. The English society for this purpose, the New Decimal Association, has just published a report of its last meeting, which contains some interesting information. Mr. Thomas Kyle pointed out a number of inconsistencies against which the British tradesman has to contend. There is the troy ounce of 480 grains and the avoirdupois ounce of 437 grains. When an apothecary sells drugs at retail he uses the first measure, although he buys them by the second. There are also three separate dram weights, the avoirdupois, fluid and apothecary, containing 27, 54 and 60 grains, respectively. Over 200 separate ways of selling wheat are used at the present time in Great Britain. Mr. R. A. Hadfield, one of the leading English steel manufacturers, said he saw no good grounds for attempting to defend a system under which the ore in one estalishment he knew about was first weighed in Cornish tons of 2,352 pounds, was then finished and weighed by long tons of 2,240 pounds, and was finally sold by tons of 2,000 pounds. As a business man he was convinced that the present system, if it was worth that name, was greatly hindering British international trade. He was sure that the recent great expansion in German industry has been much helped indirectly by the wise foresight of those who were directing the policy of that nation as to adopting the metric system from the hands of its vanquished foe.

The Design of Cars and Locomotives Considered Architecturally.

BY R. S. ATKINSON.

There occurs in one of the essays by Viollet-le-Duc, the eminent architect and writer upon architectural and art subjects, a characteristic and epigrammatic comment upon the locomotive, as an important example of modern handicraft and invention. I have not the exact words at hand, but the idea expressed was to the effect that this structure, the locomotive, is, in a sense, to be counted as a "work of art," for it is an exact adaptation of certain means to a certain end; and expresses its purpose by its external form and material. It is obvious, of course, that these might be so disposed as to produce a symmetrical and pleasing result. There seems no real reason why trains of cars and locomotives should be ugly any more than buildings or bridges should be so, and there are many examples to be pointed out in support of this, for even the most determined Utilitarians and Philistines are willing to own that there is often a direct money-return to be secured by owners of buildings, when they are so designed as to be attractive. The owner of a house owes something to his neighbors and the public; and, in making it in external form to conform to architectural and artistic principles, he is merely exercising a certain amount of courtesy and politeness to others, if nothing more.

In all times attention has been given to this question of external appearance or "design," as applied to public or private conveyances, as, for instance, the Roman and other ancient ships-of-war or galleys, Roman chariots, the ancient ships such as Columbus sailed in, even the *Mayflower*, in which the "stern-minded" Puritans sailed, exhibited the evidence of a designer's work. Also, the fact that in all times people traveled not always for business purposes, but often for pleasure or health, rendered it desirable that the artistic or surface aspect of things should receive some share of attention, rendering the various conveyances of land or sea travel attractive and inviting to the eye, as well as characteristic and expressive of their several purposes. The introduction of the Venetian gondolas at the World's Fair might be cited as a minor instance of a concession to the principles indicated; though in this special case some criticisms were made on the score of appropriateness.

As to the design of railroad cars, the form of the earliest both here and in England seems to have been derived, as might have been expected, from the stage coaches then or previously in use. But later on, in this country, the cars became mere squarish boxes, warmed in winter, as some houses were, by wood fires in iron stoves. From this time, about 25 years since, on, we may observe considerable improvement both in design and fitting up of cars, of which more variety might have been noticed here than in Europe, where the average type of railroad "carriage" has remained practically the same for many years, except upon those routes where, to a certain extent, American ideas have been adopted in the form of sleeping or drawing-room cars, modified even then to suit European ideas.

The American idea or programme followed out seems to have been a small house, or saloon upon wheels, with as many "modern conveniencies" crowded into it as possible; and as a result we have seen them recently increased as to size and weight to the utmost limit. As a contrast, the European ideal in the same direction seems to have been to devise a vehicle, or coach, as light as possible consistent with strength, and with as few unnecessary parts or fittings as po sible; the total weight of the structure and tendency to topheaviness being less, give less probability of destruction in case of accident.

To speak again of locomotives. The appearance of these has been, of course, more strictly subservient to the engineering principles observed or carried out, but it may be said that engineers have not hesitated to borrow architectural features and to use them presumably on the score of appearance. For instance, the moldings used often upon the steam dome and sand boxes have often the design derived from the so-called "Attic-base" of the classical columns; its use here is hardly appropriate. The woodwork of which the locomotive cab is made also may be seen to appropriate the usual features of cabinet work, panels, chamfers, moldings, etc. I may note also minor particulars, as iron brackets, etc., where features of architectural design have been borrowed. At one time it was customary to paint both cars and engines with elaborate "fresco painters" designs in bright colors and gilding, and a large amount of money was no doubt expended in this manner. It was certainly in bad taste, for much labor must have been required in cleaning off smoke and dust, etc. I have seen most elaborate devices upon engines, hugh chains, festoons of flowers, wreaths, coats of arms, sheaves of flags, spread eagles, or, in some cases, landscapes, such as the decorators of omnibuses used to indulge in. Brasswork also was formerly more in vogue.

As to the general appearance of the locomotive here and abroad I have seen some of the most curiously distorted or misshapen products of the engineers' art upon French lines of railway. These could, perhaps, only be paralleled by those monster structures, the "decapods,' which may be seen lumbering along with a huge load of freight cars upon our Western roads. The English engineers appear to turn out machines which, though strictly utilitarian and adapted to their purpose, yet present nothing ungainly. They have no "outriggers," and are therefore not offensive to the eye in any way. They look as if they were meant to travel fast. To return again for a moment to the field for design presented in railroad cars. The traveling public must continue to demand a certain amount of luxury in fitting up and interior accommodation as they do in steamships or other conveyances. There has been a noticeable improvement in the character of design observed in not only railroad cars, but the steamers upon various lines along the coast and Long Island Sound; also in ferryboats. As this may have resulted from the greater interest shown in architectural design to-day as compared with a former period, say 20 or 25 years back, there is nothing remarkable about it.

I may say, however, that in some cases where architects have been employed to design cars, they have employed features too obviously architectural properties for success, as bay windows, pediments, etc. I maintain that a car is not a building, but a conveyance, and should be so treated. In the former period mentioned, much use was made of a rather heavy kind of woodwork covered with varnish and gilding; loud colors also were frequent. Recent examples are better; graceful and studied lines like a ship's or yacht's cabin are more common. The cars designed by H. H. Richardson for the Boston & Albany R. R. some years ago, had much to commend them; the woodwork was simple and restrained, plain wooden seat arms, cane seats with wire baskets or racks for baggage, all of special and well adapted forms which were so suitable as at once to attract notice.

From descriptions and illustrations, I judge that recent examples of English work in this direction are in advance of anything in this country, for they have achieved more artistic and appropriate results, because less borrowing or use of architectural forms, as used in buildings, has been the rule. The writer remembers with regret when the so-called "English cars" which run upon the Old Colony line from Boston to Newport were withdrawn. These were an adaptation of English ideas, though, perhaps, less like the original than those imported for the Grand Trunk road of Canada, which were found unsuitable.

Not long since I noticed some comments in an English magazine upon the "art of the coach painter," which is much more of a separate trade or "guild" abroad, than it is here. The good taste and restraint shown is commended. Gilding is not used so much at present upon carriages; it is difficult to ascertain the reason for it was formerly much used upon royal or state carriages, in a sort of archaic splendor. At the present day it may be noted that however gaudily a mansion may be fitted from bedroom to drawing room, the coach or brougham will be a model of sobriety or quiet richness. The coach painters' art is not debased. He relies on deep pure lines relieved by a few lighter lines. A little study of this sort of work will repay the trouble. The traditions of the craft have been taken up by the railway companies. "With American cars a less chaste style has come in. But these are rather rolling houses than carriages; and therefore it may be more admissible in them."

The Northwest Railroad Club.

At the regular meeting of this club, May 14, at Minneapolis, the question, "Does it pay railroad companies to operate their own brass foundries?" was discussed. The general opinion was in favor of the plan. The meeting was followed by a banquet at which about 35 members were present.

It is announced that the receivers of the Northern Pacific will spend $70,000 at Missoula, Mont., in erecting a new passenger station and rearranging the yards.

Late in April the Missouri, Kansas & Texas started work on its fine new passenger station at Sedalia, Mo. This station is to cost abont $45,000 and will contain the offices of the company. The main building will be 45 by 212 ft., two stories high.

A tie placed on the track of the Chicago & Great Western between Green Mountain and Glad Brook wrecked a northbound passenger train May 2. The engine and three coaches were thrown down an embankment. The baggageman and brakeman were slightly hurt, but all the passengers escaped.

A company to be known as the Campbell & House Combination Freight Humane Stock Car Company has been organized at Baltimore for the purpose of handling the Campbell & House combination freight car, which was illustrated in the March issue of the NATIONAL CAR AND LOCOMOTIVE BUILDER. The officers of the company are as follows: President, Edwin Warfield; Vice-President, R. B. Campbell; Secretary and Treasurer, F. M. Hildebrandt.

The St. Louis Southwestern Railway has erected a five-stall roundhouse at Commerce, Tex. A small repair shop has been erected and yard improvements are also being made. This company has purchased a block of ground at Texarkana, Tex., where a 10-stall roundhouse, machine shop, blacksmith shop, coach shed and coal chutes will be erected soon. The shops at Tyler, Tex., have recently undergone some improvements, several modern tools having been added to the plant.

Future Types of Locomotives on Prussian Railroads.

At a recent meeting of the German Society of Mechanical Engineers, Privy Counsellor Stambke gave the following information respecting the experience had on the Prussian State Railroads with the 519 compound locomotives in use thereon, and the conclusions arrived at by the mechanical officers respecting future locomotive construction:

"All compound locomotives, under similar circumstances, when under full headway, develop a greater capacity than ordinary locomotives; at the same speed they exert greater traction, or with the same traction they make greater speed. They save fuel and water. On the other hand, ordinary locomotives have greater starting power than compounds, and, therefore, attain their standard rate of speed quicker. The time and space required for them to get under way is therefore less than with compounds, which latter, when stops are frequent, often find it difficult to make up the time lost in starting. A compound locomotive which is arranged to use steam like any ordinary one in starting, can get under way as well as the latter. It is harder to start tight-coupled express and passenger trains than freight trains, and a failure of the draft rigging and a consequent lengthening of the time of getting under way, is therefore more to be feared with the former. The Prussian State Railroads have, therefore, come to the following conclusions:

"1. Express locomotives hereafter are to be generally constructed on the compound system.

"2. In all tank locomotives and engines for branch roads the compound system is to be excluded.

"3. For freight engines used chiefly for long runs the compound system is to be employed.

"4. For freight engines used chiefly to serve among the coal districts, the compound system will be avoided for the present.

"5. For passenger engines with tenders, in view of the fact that they must make frequent stops, no decision is made yet. The experiments will be continued."

A Poor Opinion of the West.

In a speech delivered in the United States Senate in 1844, with regard to the proposal that a mail service should be established between Missouri and the Pacific Coast, Daniel Webster said:

"What do we want with this vast worthless area, this region of savages and wild beasts, of deserts, of shifting sands and whirlwinds of dust, of cactus and prairie dogs? To what use could we ever hope to put these great deserts, or these endless mountain ranges, impenetratable, and covered to their bases with eternal snow? What can we ever hope to do with the western coast, a coast of 3,000 miles, rock-bound, cheerless and uninviting, with not a harbor on it? What use have we for such a country? Mr. President, I will never vote one cent from the public treasury to place the Pacific Coast one inch nearer Boston than it is to-day."

In the light of to-day this expression seems narrow and mean; but it was shared at the time by many men quite as high above the imputation of meanness or narrowness as the illustrious Webster himself. They simply formed their conclusions by the light of half a century ago.

An Artistic Clock.

The new clock at the Broad Street station of the Pennsylvania Railroad, which has recently been put in position at the southeast corner of the building, is attracting considerable attention from the thousands who daily pass it. Every part of the clock, excepting, of course, the movements and the hands, is of terra cotta, and it is, perhaps, the most artistic and elaborate piece ever molded in that material. The design is beautiful and novel. A head and wand of mercury support the dial, with the assistance of a winged feminine figure at either side. These figures typify, respectively, Transportation, Commerce, Prosperity and Plenty, ideas which are appropriate on the escutcheon of a railroad. Sitting upon the top of the clock is a cupid, who holds at arm's length a metal lamp, which emits light only upon the face of the dial, making a most picturesque effect at night.

The figures of the exports and imports of the port of Mobile for the past 10 months have been made up, as well as the tonnage entered and cleared, and they show a very gratifying increase in the business of the port compared with the previous year.

The Pennsylvania Railroad has increased its order for 27,000 tons of steel rails, given a few months ago, and has now contracted for 20,000 tons more. The Pennsylvania Steel Company will make 8,000 tons, the Cambria Iron Company 7,000, and the Carnegie Steel Company 5,000 tons. It is said the price to be paid is $22 per ton.

The Pennsylvania Railroad lines east of Pittsburg and Erie for April, 1895, as compared with the same month in 1894, show an increase in gross earnings of $441,456.07; an increase in expenses of $327,877.49; an increase in net earnings of $113,578.58. The four months of 1895, as compared with the same period of 1894, show an increase in gross earnings of $1,598,382.76; an increase in expenses of $1,237,860.32; an increase in net earnings of $360,522.44.

Pseudonymous Railroad Names.

That many of our railroad companies have a penchant or decided taste for fictitious names, or, as the French would say, *nom de guerre*, a war name, is well known and is quite evident from the following rather formidable list of these we have compiled and arranged alphabetically for convenient reference. Our list contains sixty-five of these "war names," and while possibly not complete, is yet as much so as we have been able to make it by consulting the time tables and advertisements of over 1,100 North American railroads :

Air Line—Louisville, Evansville & St. Louis Consolidated Railroad.
Albert Lea Route—Minneapolis & St. Louis Railway.
Alton Road—Chicago & Alton Railroad.
Big Four—Cleveland, Cincinnati, Chicago & St. Louis Railway.
Burlington Route—Chicago, Burlington & Quincy Railroad.
Bluff Line—St. Louis, Chicago & St. Paul Railroad.
Belt Line—Peoria Terminal Railway.
Belt Line—Union Railway (Memphis, Tenn.).
Bonheur Route—Rome, Watertown & Ogdensburg Railroad.
Blair Line—Kansas City, Osceola & Southern Railway.
Clover Leaf Route—Toledo, St. Louis & Kansas City Railroad.
Cotton Belt Route—St. Louis & South Western Railway.
Central Route—Illinois Central Railroad.
Choctaw Line—Choctaw Coal & Railway Co.
Decatur Route—Indiana, Decatur & Western Railway.
Erie Lines—New York, Lake Erie & Western Railroad.
Evansville Route—Chicago & Eastern Illinois Railroad.
Egyptian Route—St. Louis, Alton & Terre Haute Railroad.
El Paso Route—Texas & Pacific Railway.
Friendly Hand—(obsolete) Wabash Railroad.
Fall Brook Route—Fall Brook Railway.
Florida Fast Line—Richmond, Fredericksburg & Potomac Railroad.
Four-Track Trunk Line—New York Central & Hudson River Railroad.
Green Mountain Route—Central Vermont Railroad.
Granite & Iron Route—Austin & Northwestern Railroad.
Hoosac Tunnel Route—Fitchburg Railroad.
Hoosier Route—Chicago & South Bend Railroad.
Iowa Central Route—Iowa Central Railway.
Iowa Route—Burlington, Cedar Rapids & Northern Railway.
International Route—Grand Trunk Railway.
International Route—International & Great Northern Railroad.
Katy Route—Missouri, Kansas & Texas Railway.
Keokuk Route—Keokuk & Western Railroad.
Lake Shore Route—Lake Shore & Michigan Southern Railway.
Lookout Mountain Route—Nashville, Chattanooga & St. Louis Railway.
Link Line—Trinity, Cameron & Western.
Lima Line—Ohio Southern Railroad.
Monon Route—Louisville, New Albany & Chicago Railway.
Mississippi Valley Route—Chesapeake, Ohio & Southwestern Railroad.
Memphis Route—Kansas City, Fort Scott & Memphis Railroad.
Niagara Falls Route—Michigan Central Railroad.
Nickel Plate—New York, Chicago & St. Louis Railroad.
Northwestern Line—The Chicago & Northwestern Railway.
Northwest Route—Kansas City Northwestern Railroad.
Natural Gas Route—Lake Erie & Western Railroad.
Ohio Central Lines—The Toledo & Ohio Central and Kanawha & Michigan Railways.
Overland Route—Union Pacific.
Poughkeepsie Bridge Route—Philadelphia, New England & Reading.
Pan-Handle—Cleveland, Akron & Columbus Railway.
Pigeon Mountain Route—Chattanooga Southern Railway.
Piedmont Air Line—Southern Railway.
Pennsylvania Line—Pennsylvania Railroad.
Pacific Short Line—Sioux City & Northern Railroad.
Queen & Crescent Route—Associated roads: Cincinnati, New Orleans & Texas Pacific; Alabama Great Southern; New Orleans & Northeastern; Alabama & Vicksburg; Vicksburg, Shreveport & Pacific, and the Louisville Southern Railroads.
Quincy Route—Quincy, Omaha & Kansas City Railway.
Rock Island Route—Chicago, Rock Island & Pacific Railway.
Ruta de Eagle Pass (Eagle Pass Route).—The Mexican International Railway.
South Haven Route—South Haven & Eastern Railroad.
Sulpho-Salin Route—Excelsior Springs Railroad (Mo.)
Short Line—Little Rock & Memphis Railroad.
Santa Fé—Atchison, Topeka & Santa Fé.
Scenic Route (The scenic line of the world)—Denver & Rio Grande Railroad.
Sunset Route—(Sunset, Ogden & Shasta routes)—Southern Pacific Company.
Sugar Belt Route—Chino Valley Railroad (Chino, Cal.).
Tennessee Line—Nashville, Chattanooga & St. Louis Railway.
Tarpon Route—Sanford & St. Petersburg Railroad.
Texas Pan-Handle Route—Fort Worth & Denver City Railway.
Vandalia Line—Terre Haute & Indianapolis Railroad.
Wabash Line—Wabash Railroad.
Yellowstone Park Route—Northern Pacific Railroad.

It is said that the German equivalent for our word truck is Strassenbahnwagenuntergestelle.

Improved Firebox Door, Flint & Pere Marquette Railroad.

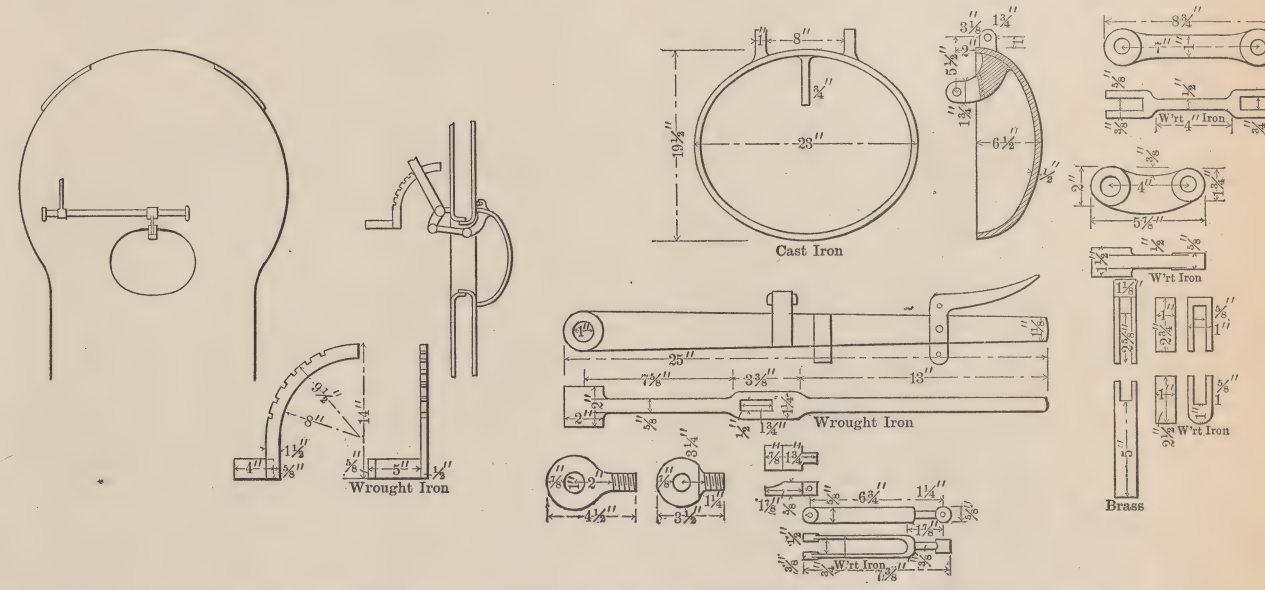
The engravings herewith reproduce drawings of an improved firebox door designed by Mr. T. J. Hatswell, Master Mechanic of the Flint & Pere Marquette Railroad, and used on the locomotives of that road. Firebox doors constitute a detail of locomotive construction which has been given but little attention, and which remains to-day in almost its original form as applied to the earliest locomotives. There is no question but that the current of cold air that is drawn through the firebox when fire doors are open exert a powerfully chilling influence on flue sheets, and this is largely responsible for the great increase of leaking flues in fireboxes over the same in smokeboxes.

The conditions that led up to the application of this form of door, and the good that resulted, are so well explained in a letter that Mr. Hatswell has written us on the subject that we quote as follows from the same:

,,The application of the device of an inside furnace door presented itself to me from the trouble we were experiencing on this road with cracking around the furnace door, and I adopted various means to try and prevent it without any very satisfactory results. I finally formed the idea of hanging the furnace door on the inside, which would keep the heat around the door epening more even than could be had from the use of the common swinging outside door. In this respect I will say that it has entirely prevented the cracking of sheets at that particular point. We have not experienced any difficulty with cracks appearing in furnaces where this door has been applied.

After it was put in application it proved that with good firing it reduces the dense volume of black smoke in a very large degree. When the door is open about twoinches you will very readily see that the air is drawn in on the fire where it will be the most effective in aiding combustion, and another good feature is that when the door is open it does not permit a possibility of a large current of coal air drawn on to the flues and causing leakage. It is therefore a good preventative for leaky flues. This door is not as expensive to maintain as it is to maintain the furnace door lining on the ordinary swinging furnace door.

I note that the drawing is incomplete, as there is a lining placed on the inside of the door, leaving an air space of three-fourths of an inch, the outside plate being perforated. The door and lining is cast iron, all other parts wrought iron. The two short eyebolts shown on the drawing are the ones that screw into the back sheet on the inside of firebox; the bolt that runs through these lugs holding the furnace door in position is protected between the lugs with a wrought iron gas pipe thimble. This is the only point about the door that we have to give close inspection in order to keep the thimble renewed so as to prevent the burning off of the bolt, which would allow the door to drop down into the furnace."



Firebox Door ,and Arrangement for Handling, Flint & Pere Marquette R. R.

Mineral Oils.

Mineral oils are closely related to each other, however much their physical properties may vary in their chemical nature. The *Oil Journal* says they all consist of a mixture of carburetted hydrogen, in different organic combinations, which possess neither acid nor basic properties. They do not decompose, either at very low temperatures or at degrees of heat which far exceed those prevailing in the steam cylinders, etc., where they are employed. They do not undergo any change in contact with the air or with water or steam; they do not attack metals, even the most easily oxidisable, such as potassium and sodium, and are as little changed or decomposed by the metals themselves. This chemical indifference is the principal advantage possessed by mineral oils over all fat oils, whether they are of vegetable or animal origin. All those fat oils decompose in time on exposure to the air at high temperatures on contact with metals or their oxides, and thus destroy, sometimes more quickly, sometimes more slowly, the parts of machinery which they are intended to preserve.

Economic Use of Ties.

Mr. E. E. R. Tratman, a student of the subject of economy in the consumption of timber for railway purposes, and who has contributed several reports on the subject to the Forestry Division in Washington, in an instructive paper on this subject states that an average of 100 railroad ties is obtained from an acre of forest, so that 26½ acres must be cleared up to supply 2,640 ties, the number necessary for one mile of new track. To this should be added 3½ acres for ties for renewal for each mile of road. To insure a permanent supply at this rate of consumption there should be maintained 113 acres of growing timber to each mile of track. The total length of railroad tracks in the United States is about 230,000 miles, with an average of 2,500 ties per mile; 575,000,000 ties are in use, while 75,000,000 to 90,000,000 of ties are annually used for construction and renewals. For ties and sawed timber for bridges and trestles, 500,000,000 cubic feet of round timber are used. This is exclusive of timber used for telegraph poles, station buildings, fences, cars and other railroad uses.

Economy in the use of railroad ties may be effected (1) by care in the selection and use of new ties. The average cost of renewals of ties on many roads already exceeds that of rail renewals, and is still increasing. (2) By care in the renewal of ties. (3) By preservation treatment. On the Southern Pacific Railroad, which has tie-preserving works of its own, the number of renewals per mile decreased from 243 in 1891 to 240 in 1892 and 205 in 1893, while the requisitions for 1894 amounted only to 145 ties per mile. (4) By protection by metal tie-plates. These tie-plates, although as yet in moderate use, have been found on a line with heavy traffic and with many sharp curves to effect an economy in maintenance expenses of 50 per cent. in ties and 75 per cent. in labor.

Economy in the use of ties in the ways noted results in economy in other directions. First, by increasing the life of the ties the number to be purchased for maintenance is reduced. Second, it enables cheaper and inferior woods to be made longer-lived and practically equal to the ordinarily more expensive and better timber. Third, the maintenance work on the track is reduced, not only by reducing the number of ties to be renewed, but also by lessening the disturbance of the track which such renewals involve. Fourth, the more permanent condition and surface of the track are conducive to greater hauling capacity of the engines and better riding of the cars. In France, for instance, the annual consumption of ties per mile of single track was reduced steadily from 170 in 1883 to 84 ties per mile in 1888, due to increased care in selection, improved methods of renewals, the use of the creosoting process and the introduction of better fastenings, better ballast and heavier rails. Fifth, by substitution of metal for wooden ties. The mileage of track with metal ties in this country is increasing more rapidly than the mileage of new railways, and the manufacture of steel ties may become as important an industry here as it already is in other countries.

The Most Powerful Light.

The most powerful light in the world, now being erected at Fire Island, New York Harbor, will be ready for use about July 1. The light, which is electric, will have a power of 50,000,000 candles without the lens. The lens, which was made in Paris, is of enormous size—about 10 feet in diameter. It will increase the power to 250,000,000 candles. It is called a bivalve lens, being in halves like the shells of an oyster. The convex halves are separated by a distance sufficient to admit the body of a man, so that the carbons and other apparatus between them may be got at. This double lens and the whole mechanical contrivance supporting it rests in a circular trough filled with mercury. It fact, its entire weight rests upon the liquid quicksilver, so that it may be revolved almost without friction. The light will be visible 100 miles out at sea through its reflection in the sky.

Locomotive Repair Shop Equipment.

BY W. H. WESTON, M. E.

(*Continued from page 70,* NATIONAL CAR AND LOCOMOTIVE BUILDER, *for May.*)

In putting in a car or truck wheel-boring machine, it should always be provided with a hub facing spindle, a machine in this way saving time and doing better work; and it is also of much advantage to have a power crane connected to the side of the machine, thus giving a chance to handle the wheels quickly and easily. The amount of time thus saved in handling the wheels amounts to a considerable figure in a year's running. The machine should always be provided with a safety stop to the boring spindle, to prevent any accident by the spindle running through into the chuck or doing damage in any way. The boring spindle should be large and strong, so that there will be no chance for it to spring or tremble in the least degree.

The chuck should be five-jawed, and so made as to run smoothly and perfectly, and hold its position with exactness; and a point of much importance in securing a machine is to have the gearing and screws to the chuck jaws of such form of construction and of such strength as to work freely and correctly, not only at first, when it is new, but continue so during a satisfactory term of usage. Taken on a chuck of such size as that of a wheel-boring machine, there is no reason why it should not be made so as to work as mentioned; and the point is to secure a machine that is so built as to give these results. For if one is in use in which the jaws do not work perfectly correct, then, of course, the wheels will be bored out of center, and the result is in such a case that the trucks will not run smoothly on the track, and a greater amount of power will be absorbed in hauling trains under which such wheels may be placed.

Another tool that it is of much importance to have highly effective is the axle lathe, there being three points in which this tool should excel: power, strength and weight. By power is meant enough to haul the heaviest cuts that any cutting tool will stand, and at the highest speed allowable. By strength is meant such form and distribution of metal in the bed and head and tail stocks, and the gearing, as will take the strain of work as direct as possible and to the best advantage; not allowing any chance for any part to spring out of position in the least. By weight is meant sufficient metal in all parts to accomplish the above and prevent any tendency to trembling. No axle lathe can come up to the mark unless it does excel in these respects. The headstock spindle should be long and large, so as to give an extra area of bearing surface, the largest that are made are none too large. In regard to equipment, the lathe should be provided with the quickest and most readily operated hoisting gear that can be had, as much time is wasted in hoisting and moving the axles where bungling gear is in use. Where there is any chance to make use of power to hoist, it should be employed. As there is usually no part of the work in a common shop that is pushed any harder than the axle lathe work, it is apparent that this tool should be as highly satisfactory as is possible, and therefore much care should be taken in putting one of them into use, to have it the best that can be procured in the way of utility and durability.

In regard to bolt cutters, it has been the tendency to consider that their work was of a rough, coarse nature, and that most anything would answer as a bolt cutter. But these tools have been brought to a good standard and will do good work, and it is advantageous to put in a proper machine. As to its qualities, it should be simple as possible, solid and compact in construction, and easily operated. It should have an automatic oil pump, and the dies made capable of being readily and quickly changed.

In most shops it is economy to have nut tapping machines; and those with a number of spindles are preferable. The spindles should be vertical and allow of changing the taps quickly and without stopping the machine; and the spindles should be so arranged that they will run at various speeds so as to conform to the requirements of various sizes of nuts.

As to the number of small and medium-sized lathes to have in a shop, of course this must be controlled by the circumstances of each situation, but at all events it is much better to have too many than too few. The usual custom of putting in quite a number of different makes of lathes is very often the cause of trouble, if a good many of very inferior quality be procured. I have found from actual experience that there are lathes on the market that are not fit for much of anything but the scrap pile, and yet such are bought very often, the result being that the work done by them is inferior in quality and also in quantity. And the probability is that as much, or nearly as much, money was paid for such lathes as would have bought the best. Every machinist knows it is common that at least 25 per cent. less work can be done on an inferior lathe, and say five such tools run in a shop for one year, with average wages at $2 per day, will cause a loss of $750 in wages, not counting the other disadvantages of having such tools in use. Consequently it is of the greatest importance to decide on a limited variety of the best make of lathes, and purchase only those of superior qualities. In order to give the highest utility a lathe should be capable of handling its given range of work readily and quickly, should have automatic feed in all directions; and should combine solidity, strength, ease of adjustment and operation in all its parts, perfect accuracy of workmanship in its construction, and the highest grade of material throughout. As there are a great many lathes that do not combine these elements, it is important to avoid them.

In regard to radial drilling machines. These are indispensable tools and there should be more of them in use than are generally found, a shop not being complete without at least one of them. And whatever the make, it should be heavy and strongly built in all its parts and especially the radial arm and column, and the lifting screw. There should be a good change of speed and feed so as to accommodate drilling and boring, and the lifting screw should always be operated by power. The base casting should be extra heavy, and be provided with T slots and a hole for the boring bar, and be planed perfectly true.

I will not mention drill presses except to say that it is better to have too many than too few, it often happening in some shops that drilling jobs have to wait because all the presses are in use at the time, and the result is that much annoyance and delaying of the work occurs when one or two more machines would give a chance for all the work to be done just when needed. Hand and drilling lathes should, of course, be supplied according to the size of the shop.

Referring again to lathe chucks. It costs about as much to put in a supply of chucks that are inferior as it does to buy good ones to start with. And it certainly is much cheaper in the long run to have the best lathe chucks that can be procured. Because there is nothing more unsatisfactory than to work with a shabby chuck that can't be set true no matter what is done; and the result is that the work is far from perfect and takes much longer to do.

Next comes the question of grinding apparatus, including grindstones and emery-wheels. The general condition of a shop, and the work that it turns out, can very often be told simply by inspection of these two things. In the first place, a shop cannot do good work unless the stones are kept in good order so that tools can be properly sharpened. A man that is competent to take charge of a shop that turns out good work will realize the importance of keeping these things in the best of order.

(To be continued.)

Sleeping Car With Compressed Air Cushions.

What purports to be an improvement in sleeping car arrangement is a system of pneumatic cushions supplied from the compressed air reservoir on the locomotive and adapted to be inflated by opening suitable valves, or to be collapsed and compactly stored inside, the bed or mattress being inflated and the chair cushions collapsed when used as a sleeping car, and the chair cushions inflated and the bed collapsed when used as a parlor car, and both being alternately operated by the compressed air, according to which use is desired, by a simple adjustment of valves in each section. We are informed by Mr. Lin S. Ruth, General Agent of the McClure Coke Company, of Pittsburgh, that the design is soon to be given a practical test in regular service. On a car equipped with this arrangement the main compressed air pipe runs longitudinally under the floor and has three branch pipes for each car section. One of the branches supplies air to the two chairs, and the other two branches supply air respectively to the upper and lower berth mattresses. The admission of air to the cushion of the bed or chairs is governed by three way cocks, which when turned one way admit the air to the cushions, and when turned another way cut off the supply and open a vent or discharge from the cushions. The upper and lower berths are constructed and arranged in a similar manner. The mattress or berth cushion has its air-tight bag creased to fold like an accordion, and at the head and foot it is attached to a flexible strip that winds upon a conical barrel of a spring. When the mattress is extended this strip is pulled out, and the spring wound up, and when the mattress is collapsed the tension of the spring winds up the strip on the barrel and folds the mattress. To guide the mattress at head and foot, and support it when extended, its bag is provided with a series of hooks that catch over the transverse frame supports made of steel. These supports at the outer ends are connected at right angles to vertical posts or standards and at their ends next to the car sides they are hinged so as to fold in a horizontal plane and lie flat against the sides of the car, when the berths are not in use. The berths are folded in a housing or casing in the sides of the car, and when it is desired to extend them for use, air is turned on. The air causes the mattresses to be inflated and extended, moving laterally across the guides and supports.

When the cushions are inflated their communication with the air pipe is cut off by a further movement of the valve. The mattress at its outer edge is connected to the panel rail which moves in and out with the mattress. This connection is made at the bottom of the rail so as to prevent the weight of the occupant from tearing any of the mattresses away. In each section occupied by two berths there are under the berths two chairs equipped exactly alike. Each has a base provided with a hinged door which forms a storage place for blankets, bed linen, pillows, etc. The chair swivels about the inlet pipe for compressing air, which latter passes through a tight collar or stuffing box, and serves to introduce air to the pneumatic cushions of the chair seat and back. The chair back frame is hinged to the base frame and folds forward on the same whenever the cushions are collapsed or emptied of air. The arm is secured to the back and is hinged to the base so as to fold inwardly over the seat, and it is rigidly held upright by a bolt when the chair is arranged for occupancy.

The advantages claimed for this invention are that it takes less time and trouble to convert the parlor car into a sleeping car than it does to make up the beds of an ordinary sleeping car. The pneumatic beds and cushions leave the car free from all lodging places for dirt, vermin or infection, and render the car much more sanitary and comfortable. There is also a great reduction in weight over the ordinary heavy cars, thereby reducing the power required for handling, which is an important item. Where cars having this improvement are detached from the train and the system of compressed air pipes, the maintenance of the air cushion or the inflating of the same is provided for by a separate air pump worked by hand.

Oil Fuel for Locomotives.

President G. B. Leighton, of the Los Angeles Terminal Railway, in an interesting account of the results of using oil for fuel on that road, states that a Baldwin eight-wheel passenger engine has been changed from coal to oil burning, with the Holden burner, as used on the Great Eastern Railway of England. This burner, briefly described, consists of three concentric tubes, the oil passing through the annular space between the outer and middle tubes, and steam from the boiler passing through the like space between the inner and middle tubes (the inner tube carrying air), the steam and oil pass into and through one combining tube, from which they are discharged through two small holes in the end forming two jets for each burner, one straight ahead, and one at such an angle with the axis of the burner that it meets the corresponding jet from the other burner about the center of the firebox, the four jets there flaring out and forming a sheet of flame which fills the box horizontally, and impinging against the front brick wall, follows back under the brick arch, and then up over it into the flues. A more intense heat is obtained than with coal, but is so evenly distributed that no objectionable local heating takes place. The bricks in the box become white hot, and retain their heat so that the engine will stand all night (10 to 12 hours) with dampers closed, and retain a pressure of 20 to 30 pounds of steam in the morning. The oil feed is regulated separately in each burner. One is arranged so that a quarter turn of the wheel shuts off the oil, and the other requires several turns. Thus one burner may be shut off simultaneously with the closing of the throttle, and the other, which is left burning during stops, as well as when running, is used, by virtue of its gradual feed, to nicely adjust the supply of oil to the demand, as indicated by the smokestack and steam gage.

The grate surface is floored over with brick except a rectangular space 24 inches long by 18 inches wide, through which air is admitted. The brick arch is longer than in ordinary practice, and by the proper adjustment of this arch and the grate opening preventing the incoming cold air from striking against the exposed parts of the sheets, no trouble need be had with leaks resulting from undue contraction when the oil is temporarily shut off or turned down, and there is no indication that boiler repairs will be materially increased.

The oil tank is built to fit in the coal space of the tender and holds a supply of 23½ barrels of oil (equivalent to about seven tons of coal), the oil being heated by a coil of steam pipes in the bottom of the tank, as more satisfactory working is obtained when the oil is thinly fluid. An air pressure of five to seven pounds per square inch is carried in the tank, this and the heating device being especially necessary in the use of heavy oils, and the wire netting and baffle plate are removed from the front end.

The engine has been heretofore running in light passenger service between Los Angeles and San Pedro, 27 miles, burning Wellington coal (Vancouver Island) costing $7.50 per ton on the tank. During experiments extending over a period of two weeks prior to the change a precisely similar engine, in essentially the same condition and in the same service, evaporated 6.2 pounds of water per pound of coal, from feed water at 60 degrees Fahr., to steam at 150 pounds pressure (366 degrees Fahr.). Since the change they have burned two different oils; the first, a Santa Paula oil, 7.5 pounds per gallon, gave an evaporation of from 11.73 pounds to 12.40 of water per pound of oil, these being the extreme limits. The least favorable of these limits makes 3.3 barrels of oil, costing $4.19, equivalent to a ton of coal, costing $7.50—a saving of 44.1 per cent., while the most favorable gives a saving of 47.2 per cent. The above is figured at $1.27 per barrel for oil. The other oil is a Los Angeles product, eight pounds per gallon, which costs 75 cents per barrel, and which has given an evaportion of 10.31 pounds of water per pound of oil, which, figured as before, gives a saving of 64.2 per cent. The approximate accuracy of the above is checked as follows: During runs covering a total of 1,094 miles with Los Angeles oil, the cost per mile for fuel has been 11.1 cents, as against an average for the previous year of 28.3 cents for coal. This shows a saving of 60.8 per cent.

Delaware & Hudson New Passenger Locomotive.

The following engravings, reproduced from photographs, show one of three new passenger engines just built by the Schenectady Locomotive Works for the Delaware & Hudson Canal Company. These engines possess a number of points which show marked improvement in the American type of locomotive for heavy, fast service. We are indebted to the builders for our description and for the photographs reproduced.

As will be seen from specifications, the engine, being designed for use of anthracite coal, has a long firebox, but, unlike the usual practice for this type of firebox, the boiler does not extend through the cab, but is so arranged that a foot plate is used, giving more convenient accommodations for engineer and fireman. In designing the engine the builders' aim was to give the largest amount of grate and heating surface with the least possible amount of weight, to effect which very light forms of piston, crosshead, connecting rods and driving wheel centers were used. The weights of the reciprocating and revolving parts are as follows:

Piston, with 3½-inch rod	301 pounds.
Crosshead	156 "
Main rod	432 "
Side rod	241 "
Main crank pin	110 "
Back crank pin	104 "

The driving wheel centers are of cast steel, and each weigh about 600 pounds less than the ordinary cast iron centers of the same dimensions. The reduced weight in revolving and reciprocating parts and corresponding reduction of weight in counterbalance, together with light wheel centers, driving boxes, etc., makes a very easy engine on the track, in fact no harder than the ordinary eight-wheel locomotive, having 9,000 pounds less weight, or 75,000 pounds on drivers. As will be seen, the boiler is sloped down from the dome and narrowed in at the sides toward back, reducing to a minimum the overhanging

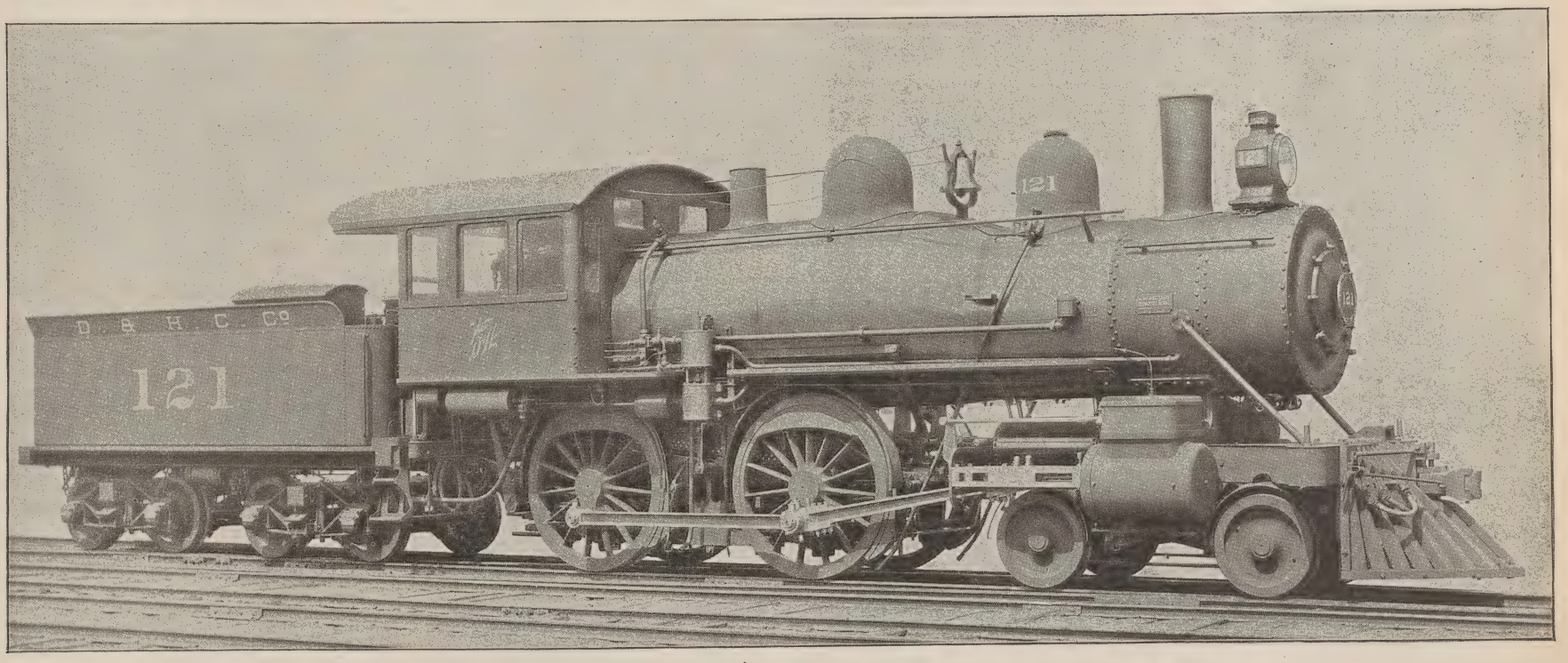
Size of steam ports	18 inches long by 1⅝ inches wide
" " exhaust ports	18 inches long by 3 inches wide
Sizes of bridges	1⅜ inches
Greatest travel of slide valves	4½ inches
Outside lap " " "	⅞ inches
Inside " " " "	0 inches, line and line
Lead of valves in full stroke,	$\frac{3}{64}$ inches forward motion; ¼ inch lap back motion
Kind of slide valve	Allen-Richardson balanced
" " " " stem packing	Metallic
Wheels, etc.:	
Diam. and length of driving journals,	8 inches diameter by 11 inches long
" of engine truck wheels	33 inches
" and length of main crank pin journal,	5½ inches by 5½ inches
" " " " side rod crank pin journal,	4½ inches by 3½ inches
Engine truck wheels	Boies steel tired; solid center
Driving springs	Hung underneath driving boxes
" " " centers	42 inches
Boiler:	
Thickness of plates in barrel and outside of fire-box,	$\frac{8}{16}$ inches, ⅝ inches, $\frac{7}{16}$ inches and ½ inch
Horizontal seams,	Sextuple riveted, with welt strip in side and outside
Circumferential seams	Double riveted
Firebox, thickness,	Crown, ⅜ inch; tube, ⅝ inch; sides and back, $\frac{5}{16}$ inch
" water space	front, 4 inches; sides and back, 3½ inches thick.
" staying	Crown bars, 5 inches wide, ¾ inch thick
" stay bolts	U. S. iron, $\frac{5}{16}$ inch and 1 inch diameter
Heating surface, tubes	1,671.2 square feet
" " water tubes	71.2 " "
" " firebox	187.7 " "
" " total	1,930.1 " "
Grate "	37.2 " "
Grate style	Water tubes and pull-out bars
Ash pan style	Hopper with open ends
Exhaust pipes	Double, high
" nozzles	2⅞ inches, 3 inches, 3⅛ inches diameter
Throttle	Balanced valve, single
Smokestack, I. D	18 inches at top, 16 inches near bottom
" " top above rail	14 feet 1¼ inches
Boiler supplied by two Nathan injectors,	one No. 10 R. S., one No. 9 L. S.
Tender:	
Wheels, number of	8
" diameter	36 inches
Journals, diameter and length	4½ inches diameter by 8 inches long
Wheel base	15 feet 10 inches
Tender frame	6½ inches by 4 inches by ¾ inch angle iron
" trucks	Channel iron, center bearing

The engine is fitted with the American outside equalized brake on all drivers, operated by air; also Westinghouse automatic air brake on tender and for train, with a 9½-inch air pump, engineeer's air signal, "Consolidated" steam plate glass at the ends of the car. The outside of the car is painted in royal blue, striped with sky blue and gold. The panels are as finely finished as those of a coach, being apparently as hard and smooth as glass, and reflecting the light like a mirror. The ornamentation and lettering is of gold and is very elaborate. The outside metal work is of hard finished, brightly polished brass, which shows against the blue ground like gold. The windows are large single panes of plate glass enclosed in mahogany sash; the glass of the doors and enclosures of the platforms are beveled glass ornamented with lines of fret work; the deck lights are of colored leaded glass of a soft golden color. The equipment of the car consists of two 25 horse power electric motors, air brakes, electric lamps and bells. It is mounted upon Bemis trucks.

The interior of the car is like a section of a steam parlor car. The scheme of color, which is beautifully carried out, is a combination of blue and gold. The woodwork is of highly polished gold-hued mahogany paneled and carved; the stanchions supporting the roof are delicately turned columns, and the cornice over the windows is moulded and carved in exquisite designs. From this cornice on each side drop silken lambrequins and curtains, trimmed with silken fringe, cords and tassels, and hang as graceful drapery between the big plates of clear glass. The curtains that shade the windows are of double-faced woolen damask in two shades of brown, hung with the most improved fixtures.

The roof linings, which at once attract the attention of the visitor on entering the car, are of sky blue enclosed in dull yellow borders and ornamented with flowers painted in natural colors and arranged in continental festoons, scrolls and wreaths. The blue ground work of these roof linings is broken by an overlay of gray clouds, making the blue color appear like that of the sky seen through the festoons and wreaths of flowers. There are three clusters of electric lights, one five and two three-light clusters, encased in oxidized silver, the metal forming the leaves and stems of lilies and the incandescent bulbs appearing like the golden-hearted flower protruding from the blue sky.

The furnishing of this car is unique. The floor is covered with a royal Wilton carpet that lies under the sky-colored roof like a patch of moss. The seats are willow and cane chairs, richly upholstered in bright colored plush. There are a dozen of these chairs and no two of them are alike; and yet they all appear to belong in the same group and to have been especially designed for this beautiful little coach.



NEW PASSENGER LOCOMOTIVE FOR THE DELAWARE & HUDSON CANAL COMPANY.

weight. The foot plate is of cast steel and very light. The driving boxes, eccentrics and straps are of gun iron, while a large number of the other heavy castings are of steeled iron, reduced in section to the minimum weight. The boiler is of the extended wagon top type, but instead of having radial stays, has crown bar staying for crown sheet, this being specified by the road. The smokebox front and door, cylinder head casings, smokestack base and dome casing are of flanged steel.

The engine is one of a lot of three built by the Schenectady Works for the D. & H. C. Company for use on heavy fast Saratoga & Montreal summer trains. Its weight in working order is 123,500 pounds, of which 84,000 pounds rest upon the drivers. The driving wheel base is 8 feet 6 inches, and the total wheel base is 23 feet 1 inch. The cylinders are 19 inches by 24 inches. The driving wheels are 68½ inches in diameter outside of tire. The tires are held on by shrinkage. The boiler is 60 inches in diameter at smallest ring, and carries 180 pounds pressure.

The firebox is 132$\frac{8}{16}$ inches long, 40⅜ inches wide. 68½ inches deep in front, and 55½ inches deep at back. It, as well as the boiler, is of Otis steel.

The tubes are of charcoal iron (No. 12 wire gage), 288 in number, 2 inches in diameter, and 11 feet 2 inches long over tube sheets.

The tender holds 4,000 gallons of water and eight tons of coal. Its weight when empty is 39,500 pounds, and its wheel base is 15 feet 10 inches. The total wheel base of engine and tender is 38 feet 11 inches, and the total length 58 feet 10⅜ inches.

The following table gives further information of interest concerning the detailed dimensions of these splendid locomotives:

Cylinders and valves:	
Horizontal thickness of piston	4¾ inches at rim; 5¾ inches at hub
Kind of piston packing	Cast iron rings
" " " rod packing	Metallic
Diam. of piston rod	3½ inches

heating apparatus, "Trojan" coupler on front of engine and rear of tender, Leach's pneumatic sand feeding apparatus on sandbox, and Corey's patent force feed lubricator for oiling all bearings.

A Beautiful Little Coach.

Although a few private street cars have been built, as previously mentioned in the NATIONAL CAR AND LOCOMOTIVE BUILDER, they are as yet so limited in number and distribution as to be of exceedingly novel interest to everybody. Only a few years ago any old box that would ride on wheels was considered good enough for people to ride in on street railroads, but a few enterprising companies here and there tried the experiment of buying new cars of decent appearance and comfortable arrangement. The quick appreciation and increased patronage evoked by the improvement caused the general betterment in street-car construction so noticeable during the last five or six years. The end is not yet, and we are coming upon still better things. It is quite within probability that in the next decade many features contributing to the comfort and convenience of passengers that are yet sacred to private cars will come into general use on the ordinary cars of street railroads.

As showing what is being done in the matter of private street car construction we quote the following from our enterprising contemporary *The Car*, a journal devoted to street railways. The car described was recently built for the Fair Haven & Westville Railroad Company, of Connecticut, by the Jackson & Sharp Co., of Willmington, Del.:

It is the ordinary electric car so far as size is concerned, with vestibuled platforms, the motorman and conductor a ving apartments enclosed with handsome woodwork and

The Berliner Patent Declared Valid.

On May 18 the United States Circuit Court of Appeals handed down a decision in the Bell-Berliner telephone case, declaring the Berliner patent valid. This is a decisive victory for the Bell Telephone Company. Judge Carpenter, on Dec. 18, 1894, decided that the Berliner patent was invalid, and ordered it to be delivered up for cancellation. The company appealed. The Berliner patent was issued on Nov. 17, 1891. The inventor is Emile Berliner. The instrument covered by it is a device commonly known as a telephonic transmitter. In case the patent is finally held valid the Bell company will virtually have a monopoly until 1908.

The United States relied upon two grounds to show that the patent was void. The first was that there was illegal delay in its issue. The second was that a prior patent was granted upon the same application to the same applicant for the same invention. This prior patent referred to was one granted to Berliner in 1880. The decision of Judge Carpenter sustained the two grounds of attack made by the Government. The case will probably be appealed to the Supreme Court.

NATIONAL CAR AND LOCOMOTIVE BUILDER

ESTABLISHED IN 1870.
PUBLISHED MONTHLY
BY
R. M. VAN ARSDALE,
MORSE BUILDING.....NEW YORK.

GEORGE H. BAKER, Editor.

HERBERT W. POOL, Business Manager.

JUNE, 1895.

Subscription.—*$2.00 a year for the United States and Canada; $2.50 a year to Foreign Countries embraced in the Universal Postal Union.*

EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING PAGES. *The reading pages will contain only such matter as we consider of interest to our readers.*

Special Notice.—*As the* NATIONAL CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, correspondence, advertisements, etc., intended for insertion must be received not later than the 25th day of each month.*

Contributions.—*Articles relating to railway rolling stock construction and management and kindred topics, by those who are practically acquainted with these subjects, are specially desired. Also early notices of official changes, and additions of new equipment for the road or the shop, by purchase or construction.*

To Subscribers.—*The* NATIONAL CAR AND LOCOMOTIVE BUILDER *is mailed regularly to every subscriber each month. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery, and in case the paper is not then obtained this office should be notified, so that the missing paper may be supplied.* **When a subscriber changes his address** *he ought to notify this office at once, so that the paper may be sent to the proper destination.*

THE MASTER CAR BUILDERS' AND MASTER MECHANICS' CONVENTIONS.

The twenty-ninth annual convention of the Master Car Builders' Association will be held at Thousand Islands, beginning June 11. The twenty-eighth annual convention of the American Railway Master Mechanics' Association will meet at the same place, beginning June 17. The place at which the conventions will be held is one of the most popular resorts in the estimation of the thousands who attend the conventions and it is probable that there will be ample accommodation for the members and guests.

The first subject to be considered in the Master Car Builders' convention will be the "Interchange of Cars," to suggest how cars may be maintained equitably to owners and operators with the least expense and detention. This subject is not only first on the list but it is first in the minds of most of the members who will attend both conventions, because it is the most important subject that will come up at the conventions this year for settlement, and because the probable result of its consideration will be a revolution in the prevailing methods of freight-car interchange. Many powerful interests demand a more expeditious movement of cars and interchange, and there is a strong general sentiment that the present plan of interchange has outlived its usefulness.

A heavy committee is to report on "Road Tests of Brakeshoes," and a light committee (in numbers) will report on "Laboratory Tests of Metal for Brakeshoes." As a financial consideration this is a matter of much importance to railroad companies, and as the matter has been under consideration for several years, it is expected that some definite conclusions will be presented by the committees in reference to what is the best metal for brakeshoes, everything considered. "Lubrication of Cars" is the important subject that another report will be made on by the same committee that contributed so much valuable knowledge on this matter to the convention last year.

Two new subjects will be reported on that will prove interesting to the members. One of these is "Coal Car Sides," to suggest the best methods of construction of these on 60,000-pounds capacity coal cars with high sides. The other and more important is "Passenger Car Ends and Platforms," to consider what improvements may be made in the construction of these to obtain greater strength. This is a new line of inquiry that was suggested by articles in the NATIONAL CAR AND LOCOMOTIVE BUILDER 18 months ago (see issues for January and February, 1894). About the weakest point in passenger-car construction is the end framing, and this constitutes an element of danger, as in case of collission telescoping is invited and facilitated by this weakness. In the careful consideration of this matter the convention can render a very important service to American railroad companies and the traveling public.

There are 11 subjects to be reported on by committees to the Master Mechanics' Convention, nine of which are new. The two continued from the last convention are: "Exhaust Nozzles and Steam Passages" and "Locomotive Fire Kindlers." Each of these matters are of such importance in the economic operating of locomotives that further information concerning the same will be very gladly received by motive power officers.

"Shop Tests of Locomotives" has a strong committee, and it is likely that the possible advantages of this form of tests will be fully set forth in the report on the subject. The committee on "Gages for Sheet Metal, Tubes and Wire," will confer a blessing on mechanics if its report aids in bringing about the adoption of a practical system for gaging these articles of commerce. The prevailing confusion resulting from the variety of systems followed is both annoying and expensive.

The "Utilization of Railroad Scrap Material" affords a wide field for a form of economy that has received increasing attention during the last couple of years. The report of a committee on the subject will serve to stimulate interest in it, while it is probable that some valuable suggestions will be made. A matter of much less importance, "Causes of Bulging of Fire Box Sheets," will be reported on, but it is doubtful if any very new or very interesting information in regard to this occasional trouble will be submitted.

A more promising subject is the "Best Material for Boiler Tubes and Specifications for Same." This is a matter that effects not only the cost of maintenance, but also the consumption of fuel, and it is probable that it is of most importance considered in the latter light. A good deal has transpired during the year to help this committee make an interesting report. How valuable it will prove will depend on the zeal exercised in carrying into practice the teachings of experiments. The report on the relative merits of pneumatic and electric transmission of power in railroad shops will treat of a subject that the trend of current practice has practically decided, for the present, at least, in favor of that exceedingly elastic, clean and safe medium, compressed air.

Altogether, the promise is strong that the coming meetings of the associations will prove enjoyable and interesting to the members, and of unusual value to the transportation interests of the country.

DRINKING WATER ON LOCOMOTIVES.

A curious accident occurred on the Iron Mountain road May 4, by which a passenger train and a light freight engine collided and 13 passengers were injured, none, however, fatally. The freight train had orders to meet the passenger train at Clarksville. With the detached engine a stop was made at the depot to inquire about further orders, and while the engineer was in the office the fireman left the engine to get a drink of water. Either through a defective or leaky throttle, the engine, thus left to itself, run away and eventually came into collision with the oncoming passenger train, with disastrous results.

It may appear to some that the cause of this accident was the fireman having to leave the engine to get a drink of water, while others will hold that both members of the crew were to blame for leaving the engine alone in such condition that it was possible for it to run away. The latter view is doubtless correct, and the disaster was simply the result of gross carelessness. But there is something in the first proposition, also. Why should an engineman have to seek elsewhere than on his engine for a good drink of water while on the road? Would not the comfort and general health of the men be greatly promoted if a supply of good drinking water was carried on the engine, and means provided for keeping it cool and refreshing? This is done on some few roads, and the results are highly satisfactory to all concerned. The common practice of having no provision for drinking water on locomotives, except the feed water in the tank, is uncivilized to say the least, and in hot weather and in districts where the well and surface waters are not pure, the discomfort and positively injurious results to the enginemen are generally great and sometimes very severe.

The writer recalls more than one occasion during his firing days when he was made dangerously ill by bad water taken from the tank. This experience is doubtless repeated many times every day in summer when the hard, hot work that firemen do makes them feverishly thirsty. The growing practice of putting a form of boiler purge occasionally in the tank to be dissolved there and fed to the boiler, makes it all the more necessary that a separate supply of drinking water be provided for the enginemen.

THE SPEED OF STREET CARS.

Within a couple of years electric has supplanted horse motive power on the street railways of Brooklyn. Numerous fatal accidents resulted owing to the higher speed at which the electric cars run, but mostly to the carelessness and ignorance of the victims. The strike of motormen and conductors on these lines a few months ago necessitated the employment of many new men, and resulted in a large increase of accidents. The clamor of the daily papers, calling for interference with the operation of the roads, resulted in the municipal authorities adopting stringent regulations limiting the speed of cars in the business part of town to 6 miles an hour, to 8 miles an hour in the residence portion and allowing 10 miles an hour in the outskirts of the city, also requiring the cars to slow up at each street crossing and to stop at the near side of the street when passengers wish to get on or off, instead of the far side, as usual.

The people and the papers are making more fuss now about the slow time and disagreeable motions of the cars in slowing up so frequently than they previously did about casualties that occurred in consequence of faster service, and modifications of the regulations are loudly demanded. This simply teaches what the people ought to have sense enough to know without being taught—that faster street car service meant, at the start, a natural increase of accidents, until people learn to adjust themselves to the circumstances and keep out of the way of fast moving cars. The work of education was necessarily severe, but its lessons had to be taught. Now, when the work is practically accomplished, the cars are put back to their former snail's pace, and make poorer time than they did with horses. This is ridiculous, and, of course, cannot long continue. The restrictions must eventually be set aside and faster speeds adopted, and the people must simply learn to keep out of the way. The public convenience demands the rapid movements of street cars in all large cities; and those who have not sense enough to respect the necessities of the case and keep out of the way must suffer the consequences.

SAVING OIL.

A judicious and economic use of any supply required in railroad operating is entirely commendable, because wastefulness is only too common, and results in unnecessary expense, which multiplied by the many articles of supply used aggregates very large sums of money. Care should be exercised to avoid this, but what is wanted is judicious care, not injudicious care, and the latter is not unknown. We have noted with regret that the efforts to economize in the use of lubricating oil have practically degenerated into a fad on some roads, more attention being given to it than to the matters of the cost of repairs and the cost of fuel.

Doubtless, by stinting in oil, it can be made to appear that some few thousand dollars are saved in a year by the reduced quantity used, but it is an open question if there has been any real large economy resulting. The objects of lubrication are to avoid friction and its consequent wear and retarding force. Tests have shown that a bath of oil is the most perfect lubricant. Of course, there should be no waste permitted, but when the supply is stinted how much is friction increased? How much is the wear of internal and external rubbing surfaces increased? And how much more coal must be burned to generate the power necessary to overcome the increased resistance? Possibly if these losses were measured it would be found to be the wrong kind of economy to be too saving of oil.

It has come to be the practice on some railroads to rank the performance of locomotives according to their most economic use of supplies. We have observed with disappointment that in nearly every such case the importance of saving oil is made paramount. A plan of monthly locomotive records published recently adhered to this policy, and we have noticed the same tendency in the performance sheets of many roads. Considering the fact that the coal consumed by locomotives costs about 40 times as much as the quantity of lubricating oil required, it is evident that this practice is radically wrong.

Signs of decided and widespread improvement in the general business situation multiply on every hand. Not since the spring of 1893 has such activity been noticed. The revival is not confined to any one line of industry, but all classes of manufacture and trade feel the good effects. Old works that have been idle two years or more are resuming, plants that have been operating on part time have increased working forces, and numerous manufacturies have advanced the price of labor. Perhaps the latter feature, the increase of wages, is one of the best possible signs. It indicates established improvement and it insures further improvement. During May, over 50,000 workmen have had their pay increased 10 per cent. We have record of this many, and it is probable that the actual number is as much again. Advertising is properly considered a strong indication of business activity, and this is on the rapid increase. Over 20 new advertisements of rolling stock appliances and supplies, amounting to about $2,500, appear in this issue. Everything indicates that we are rapidly returning to a period of at least normal industrial and commercial activity.

We have cause for congratulation that the Supreme Court has sustained the action of the Circuit Court in issuing an injunction to restrain Debs and his associates of the American Railway Union from interfering with the movement of interstate traffic last July; and sustained the sentence of six months in jail imposed on these men as punishment for their defiance of the same. This is a nation of law-abiding and law-enforcing people, because the people themselves make the laws. These are made for the general welfare of the nation. It is coming to be more generally understood that the national laws regulating and protecting commerce and transportation are among the most important and most sure to be enforced vigorously and impartially. These laws are amenable to alteration if unwise or unfair, or to be completely set aside by the proper tribunal if inconsistent with the Constitution; but while they exist as laws they must be respected.

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A DISTINGUISHED COMPANY.

We are pleased to present our readers with this issue a full-page plate of portraits of fifteen prominent American railroad presidents. The portraits are reproduced in each case from an original photograph sent us by the gentleman it represents specially for the purpose of appearing in this group, and we wish here to express to these gentlemen our high appreciation of the courtesy shown us in this matter. Most of the photographs are quite recent ones, and all are good likenesses, although in the number presented, which were taken in all parts of the country and under different circumstances, it is impossible to expect artistic perfection in each. We think our readers will agree with us, however, that a group of finer-looking men would be hard to find. Their countenances give evidence of the high mental qualities and executive ability that have placed them at the head of America's greatest railroads, and placed these in the lead of the railroads of the world, making their practice an example that the railroads of other countries are glad to follow. In the arrangement of the portraits in our group we have given the artist a free hand, and consequently preference in position is given none except from an artistic standpoint.

MR. GEORGE BROOKE ROBERTS, President of the Pennsylvania R. R. Co., was born in 1833 on a farm in the close vicinity of Philadelphia. He received his professional training in the Polytechnic Institute of Troy, N. Y., and immediately upon graduating began his railroad career on the mountain division of the Pennsylvania R. R., upon which he was first employed as a rodman. In 1852, while still but 19 years of age, he was made Assistant Engineer of the Philadelphia & Erie R. R., and during the 10 years that followed was very actively engaged in railroad engineering, aiding in the location and construction of various roads. On several of these he was employed as Chief Engineer, and brought them to completion. In 1862 Mr. Roberts returned to the Pennsylvania R. R., his official position being that of Assistant to the President, Mr. J. Edgar Thomson. His term of duty in this position continued for seven years, after which, in 1869, he was promoted to the position of Fourth Vice-President. Almost immediately afterward he received a second promotion, being elected Second Vice-President. On June 3, 1874, Col. Thomas A. Scott succeeded J. Edgar Thomson in the presidency, and Mr. Roberts was advanced to the post of First Vice-President. Colonel Scott died in May, 1880, and Mr. Roberts was chosen to succeed him as the President of the company, an office to which he has since been annually re-elected. Mr. Roberts' ancestors came to this country from Bala, Wales, over 200 years ago, and settled near Philadelphia. He still resides on the farm they claimed from the wilderness, and in the house where he was born; In their honor he has named the farm "Bala" and has also given this name to the adjoining station on the Schuylkill Branch of the Pennsylvania R. R., on the northwestern edge of Fairmount Park. The interesting coincidence is recorded that on the very day the first British train reached Bala in Wales the first American train reached Bala in Pennsylvania. Mr. Roberts passes an ideal life between his Philadelphia office and his home on the farm, to which he generally returns every afternoon.

MR. SAMUEL SLOAN, President of the Delaware, Lackawanna & Western R. R. Co., was born at Lisbon, near Belfast, Ireland, December 25th, 1817, the family coming to this country a few years later. In 1831 he became identified with an Irish importing house, McBride & Company of New York, and became partner in 1845. In December 1854 Mr. Sloan was elected a director of the Hudson River R. R., and in the following February was elected President and at once assumed its management. The stock was then selling at $17 per share, and at the time of his retirement in June 1864 its market value was $140. On the occasion of the first dividend he received from the Board of Directors of the road, in 1864, a handsome service of plate with an appreciative testimonial of the unfeigned respect they entertained for him personally, believing that to his energy and fidelity and to his judgment and ability, the prosperity and strength of the company was due. In 1865 Commodore Vanderbilt offered Mr. Sloan the Presidency of the New York & Harlem R. R., but the offer was declined. In the meantime Mr. Sloan was selected as Arbitrator of the Trunk lines including the Erie, Pennsylvania, New York Central and Baltimore & Ohio Railroad Companies, settling difficulties arising out of conflicting interests between these organizations. In 1864 he was elected a director of the Delaware, Lackawanna & Western R. R. Co., and in 1867 was elected President of the company. Under his management the road rapidly, by means of leases and construction, reached tide-water over the Morris & Essex R. R., Lake Ontario by the Syracuse, Binghamton & New York and Oswego & Syracuse Railroads, Utica and Richfield Springs by the Utica, Chenango & Susquehanna Valley R. R., and Buffalo in 1882 over the new line, New York, Lackawanna & Western R. R., this forming a complete system draining the great Pennsylvania coal regions north, west and to tide-water, and making another trunk line for freight traffic between the lakes and the seaboard. Mr. Sloan was elected President of the New York Central R. R. in 1866, which office he held for two years. He was also President of and reorganized the Marquette, Houton & Ontonagon R. R. of Michigan and the International and Great Northern of Texas. He was President of the Rome, Watertown & Ogdensburgh R. R. from 1876 to 1883, and has been President of the Fort Wayne & Jackson R. R. since 1880, and of the Green Bay, Winona & St. Paul R. R. since 1881. He is a director and member of the Executive Committee of the Manhattan Ry., the Western Union Telegraph Company and the Missouri Pacific R. R. Mr. Sloan is a director of the Consolidated Gas Co., of New York, and has been for many years upon the Board of Directors of the United States and Farmers' Loan and Trust companies, the National City Bank, and he is one of the founders and directors of the Mechanics Bank of Brooklyn, and the Mechanics Insurance Co. At the beginning of the war, while President of the Hudson River R. R., Mr. Sloan was an active member of the Union Defense Committee of the city of New York, appointed at the public mass meeting of April 20, 1861. This committee was an element of great strength to the United States Government and was recognized as such throughout the country.

MR. CHAUNCEY MITCHELL DEPEW, President of the New York Central & Hudson River R. R. Co., was born in Peekskill, N. Y., April 23, 1834. Like many other famous men, Mr. Depew inherited his distinguishing characteristics from his mother, born Martha Mitchell, who is described as a lady of marked personal beauty and fine accomplishments, and the daughter of a distinguished orator. Mr. Depew graduated from Yale College in 1856, and in 1887 that college conferred upon him the degree of Doctor of Laws. In 1866 Mr. Depew was appointed attorney for the New York & Harlem R. R., and in 1869, when this road and the New York Central were consolidated and became the New York Central & Hudson River R. R., he was made attorney of the new organization, and in 1875 was promoted to be General Counsel of the entire Vanderbilt system, and was elected to a directorship in each of the lines comprised in it. In 1882 Mr. Depew was made Second Vice-President of the New York Central, and in 1885, on the death of Mr. James H. Rutter, succeeded that gentleman as President of the company, which position he has since held.

MR. STUYVESANT FISH, President of the Illinois Central R. R. Co,, was born in New York City, June 24, 1851, and was educated there at Columbia College. He entered railway service October 1, 1871, as a clerk in the office of the Illinois Central. In June, 1872, be became Secretary to the President, but left railroad service in the fall of that year to accept a clerkship with the banking houses of Morton, Bliss & Co., of New York, and Morton, Rose & Co., of London. In 1876 he became a director of the Illinois Central, and a year later became Secretary of the Chicago, St. Louis & New Orleans R. R., and in 1882 was made Vice-President of the same. From 1883 to 1884 he was Second Vice-President of the Illinois Central, becoming Vice-President of the same May 14, 1887, and President four days later, May 18.

MR CHARLES ELLIOTT PERKINS, President of the Chicago, Burlington & Quincy R. R. Co., was born in Cincinnati, O., November 24, 1840. He entered railway service in 1859 as Cashier of the Burlington & Missouri River R. R., which position he held for three years. From 1862 to 1865 he was Assistant Treasurer and Secretary, and from that date until 1873 he was General Superintendent of the same road. He became Vice-President in 1873, and held that office until 1880, when the Burlington & Missouri River and the Chicago, Burlington & Quincy Railroads were consolidated. He was Vice-President and General Manager of the Chicago, Burlington & Quincy from 1876 until in 1881, when he became President.

MR. MARVIN HUGHITT, President of the Chicago & Northwestern Ry. Co., was born in Genoa, N. Y. He entered railway service in 1856, and from then until 1862 was consecutively Superintendent of Telegraph and Train Master of the St. Louis, Alton & Chicago (now Chicago & Alton) R. R. During the two succeeding years, 1862 to 1864, he was Superintendent of the Southern Division of the Illinois Central, and from 1864 to 1870 he was General Superintendent of the same road. From 1870 to 1871 he was Assistant General Manager of the Chicago, Milwaukee & St. Paul, and in the following year he was General Manager of the Pullman Palace Car Company. He went to the Chicago & Northwestern in 1872 as General Superintendent, and served as such until 1876, when he became General Manager. In 1880 he was promoted to the Vice-Presidency of this road, and in 1887 he became its President.

MR. EDWARD TURNER JEFFERY, President and General Manager of the Denver & Rio Grande R. R., was born in Liverpool, England, April 6, 1843, and began his railroad career on the Illinois Central as office boy for the Superintendent of Machinery. After about three months he became an apprentice in the shop, but soon became an office boy again. From 1859 to 1863 he was an apprentice in the drafting room, and then became mechanical draftsman and secretary to the Superintendent of Machinery. Serving in this capacity for eight years he then, in 1871, became Assistant Superintendent of Machinery; this position he held until 1877, when he was promoted to be General Superintendent of the road. In 1885 he became General Manager, and held the position until 1889, when he resigned. Since Oct. 1, 1891, Mr. Jeffery has been President and General Manager of the Denver & Rio Grande. As a mechanical officer Mr. Jeffery was a very active worker in the American Railway Master Mechanics' Association, and has always taken a great interest in rolling stock problems.

MR. OSSIAN D. ASHLEY, President of the Wabash R. R., was born in Townsend, Vt., April 9, 1821. He entered railroad service in 1879 as Second Secretary and Transfer Agent of the Wabash, St. Louis & Pacific. From 1885 to 1887 he was a member of the purchasing committee that reorganized the tangled affairs of that company during the period named. Mr. Ashley became President of the Wabash Western in 1887, and in 1889, when the lines in Illinois were rescued from the receivership, he became President of the reorganized Wabash R. R. Co. Mr. Ashley is an industrious student of railroad problems, and considers that one of the most important of these is the labor question. During the last year he has written a number of articles on this question for the *Railway Age*, and in these has given a great deal of valuable advice to both employers and emyloyees.

MR. LUCIUS TUTTLE, President of the Boston & Maine R. R. Co., was born in Hartford, Conn., March 11, 1846, and entered railway service in August, 1865, as a clerk in the ticket office of the Hartford, Providence & Fishkill Ry., of which he became General Ticket Agent in 1878. He went to the New York & New England in that year as Assistant General Passenger Agent, and in 1879 he became General Passenger and Ticket Agent of the Eastern Ry. From 1885 to 1887 he occupied the same position on the Boston & Lowell, and from 1887 to 1889 was Passenger Traffic Manager of the Canadian Pacific. From 1890 to 1892 he was General Manager of the New York, New Haven & Hartford, of which road he became Vice-President in 1892. In August, 1893 he became President of the Boston & Maine.

MR. GEORGE J. GOULD, President of the Missouri Pacific Ry. Co., was born Feb. 6, 1864. At the age of 16 years he became a clerk in the office of Mr. Washington E. Connor, a prominent stock broker, of 71 Broadway, New York City. Mr. Gould continued as a clerk there for about three years, and then entered the office of his father, the late Jay Gould, in the Western Union Building, 195 Broadway, New York. This has always since been his headquarters. Soon after leaving the service of Mr. Connor he became President of the Pacific Mail Steamship Co. Mr. Jay Gould died Dec. 2, 1892, and Mr. George Gould succeeded him as President of the Missouri Pacific and operated lines, and of the Manhattan Railway.

MR. JOSEPH S. HARRIS, President of the Philadelphia & Reading R. R. Co., is a native of Chester County, Pennsylvania, where his ancestors have lived since the first settlement of the State. His earliest service was in the engineer corps of the North Pennsylvania R. R. After ten years in the service of the United States Government on the Coast Survey, and on the survey of the Northwest boundary, and on the Mississippi River in 1862 with Admiral Farragut, he spent several years in the Schuylkill coal region as a railroad and mining engineer. He was Chief Engineer of the Morris & Essex Railroad from 1868 to 1871, Associate Engineer of the Philadelphia & Reading Coal & Iron Company from 1871 to 1877, Superintendent of the Lehigh Coal and Navigation Company from 1877 to 1880, General Manager of the Central Railroad of New Jersey from 1880 to 1882, President of the Lehigh Coal and Navigation Company from 1882 to 1893, Receiver and afterwards Vice-President of the Central Railroad of New Jersey from 1887 to 1890, and President of the Philadelphia & Reading Railroad Company since 1893.

MR. GEORGE H. NETTLETON, President and General Manager of the Kansas City, Fort Scott & Memphis R. R. Co., was born at Chicopee Falls, Mass., November 13, 1831. He began railroad service in 1851 in the engineering department of the New Haven & New London R. R. He became Assistant Engineer of the Terre Haute & Alton in 1852. In 1854 he assisted in making the preliminary surveys for what is now the Chicago & Alton R. R. Between 1857 and 1872 he was successively Resident Engineer, Auditor and Purchasing Agent, Chief Engineer, Assistant Superintendent and General Superintendent of the Hannibal & St. Joe. He was then for two years General Superintendent of the Atchison, Topeka & Santa Fe, then for six years General Manager of the Atchison & Nebraska. From 1874 to 1880 he was General Manager of the Kansas City, St. Joseph & Council Bluffs, and from 1874 to the present he has held numerous similar positions on different roads. He became President of the Kansas City, Ft. Scott & Memphis in 1888.

MR. ROSWELL MILLER, President of the Chicago, Milwaukee & St. Paul Ry. Co., was, previous to May, 1882, successively Secretary and General Superintendent of the Cairo & Vincennes R. R. On that date he became Second Vice-President and Treasurer of the Chicago and Western Indiana R. R., and in 1883 he went to the Chicago, Milwaukee & St. Paul as Assistant to the General Manager. He was appointed Assistant General Manager a year later and served in this capacity one year, when he became General Manager, which office he held for three years. He became President and General Manager in 1888. Since 1890 he has been President.

MR. SAMUEL SPENCER, President of the Southern Railway Company, was born at Columbus, Ga., March 2, 1847. Mr. Spencer graduated as a Civil Engineer from the University of Virginia in July, 1869; and from August, 1869, to July, 1872, he served as rodman, leveler, transitman, Resident Engineer and Principal Assistant Engineer of the Savannah & Memphis Railroad. From July, 1872, to December, 1872, he was Clerk to the Superintendent of the New Jersey Southern Railroad. December, 1872, to April, 1877, Assistant Supervisor of Trains and Supervisor of Trains, Baltimore & Ohio Railroad. April, 1877, to January, 1878, Superintendent of Transportation Virginia Midland Railway. January, 1878, to October, 1879, General Superintendent Long Island Railroad. From October, 1879, to December, 1888, successively Assistant to the President, Acting General Manager, Third Vice-President, Second Vice-President, First Vice-President and President of the Baltimore and Ohio Railroad. In March, 1889, Mr. Spencer entered the service of Drexel, Morgan & Company (now J. P. Morgan & Co.) as railroad expert. Since June, 1894, he has been President of the Southern Railway Company.

MR. SAMUEL R. CALLAWAY, President of the New York, Chicago & St. Louis R. R. Co., entered railway service in 1863 as a clerk in the office of the Auditor of the Grand Trunk Ry. From 1869 to 1871 he was Chief Clerk to the Superintendent of the Great Western R. R., and from then until 1874 he was Private Secretary to the General Manager of the same road. In the latter year he became Superintendent of the Detroit & Milwaukee Ry., and held that office for four years, when he became General Superintendent of the Detroit, Saginaw & Bay City R. R. From 1881 to 1884 he was General Manager of the Chicago & Grand Trunk, and President of the Chicago & Western Indiana. From 1884 to 1887 he was Second Vice-President and General Manager of the Union Pacific, and became President of the Toledo, St. Louis & Kansas City in 1887. He succeeded Mr. D. W. Caldwell as President of the New York, Chicago & St. Louis R. R. in January, 1895.

Personal.

Mr. J. S. Leonard has been appointed Receiver of the Pensacola and Perdido.

Mr. George W. Saul, President, was, on May 9, appointed Receiver of the Ohio Southern.

Mr. Charles Royal has been appointed Master Mechanic of the Seaboard Air Line at Portsmouth, Va.

Mr. H. M. Burgand has been appointed Purchasing Agent of the Western Maryland, with office at Baltimore.

Mr. B. E. McIntyre has been appointed Purchasing Agent of the Mexican Central, succeeding Mr. E. W. Baker, resigned.

Mr. George Coleman has been appointed General Foreman of the shops of the Ohio River Railroad at Parkersburg, W. Va.

Sir Charles Rivers Wilson was, on May 7, chosen President of the Grand Trunk Railway to succeed Sir Henry Tyler, resigned.

Mr. M. M. Reid has been appointed Master Mechanic of the Atlantic and Danville Railroad, with headquarters at Portsmouth, Va.

Mr. C. W. Corson has been appointed Assistant to the Superintendent of Motive Power and Machinery of the Pennsylvania Railroad at Altoona.

Mr. W. H. Riley, formerly Master Mechanic of the Gulf, Colorado & Santa Fe, has been appointed Master Mechanic of the new Trinity, Cameron & Western.

Mr. F. K. Hain, previously Second Vice-President and General Manager, is now Vice-President and General Manager of the Manhattan Elevated Railroad.

Mr. H. C. Barlow, President of the Evansville & Terre Haute, has been appointed Receiver of the Evansville & Richmond Railroad, vice James Montgomery, resigned.

Mr. Charles E. Walker, Superintendent of Motive Power of the Toledo, St. Louis & Kansas City, has tendered his resignation, to take effect June 1, to accept a position on a southern road.

Col. Alfred Simms, the General Manager of the East Broad Top Railroad and of the Rock Hill Iron & Coal Company, of Pennsylvania, died at his home in Huntingdon recently in his 69th year.

Mr. John R. Kenly, General Manager of the Atlantic Coast Line, has been appointed a delegate to the International Railway Congress, in place of Mr. Joseph Ramsey, Jr., who cannot attend the congress.

Mr. Henry Watkeys has been appointed Master Mechanic of the Louisville, New Albany & Chicago Railway, to succeed Mr. H. Delaney, resigned. Mr. Watkeys was formerly Master Mechanic of this road.

Mr. J. H. Jones, for nearly 15 years General Superintendent of the Ulster & Delaware Railroad, has resigned to engage in other business, and Mr. Austin E. Benson, Superintendent of Motive Power, has been appointed General Superintendent in Mr. Jones' place. Mr. A. W. Belcher is appointed Master Mechanic.

Mr. John King has retired as one of the Receivers of the New York, Lake Erie & Western Railroad Company, and Mr. E. B. Thomas, the President, has been appointed in his place. Mr. King was forced to resign from the Presidency of the road several months ago, also on account of ill-health. He was formerly for 27 years with the Baltimore & Ohio, during which time he was successively Ticket Agent, Paymaster, Auditor, General Freight Agent, and Vice-President. He has been President of the New York, Lake Erie & Western for 11 years.

Mr. Amos R. Barrett, ex-Superintendent of Motive Power and Machinery of the Boston & Maine, died at his home, in Somerville, Mass., May 12. Mr. Barrett was born in Boston in 1833, and began as an apprentice in the machine shops of the Eastern R. R., now a part of the Boston & Maine. He subsequently served as fireman, and for twenty years as Master Mechanic of the B. & M., and in 1882 resigned to go to the Atlantic & Pacific as Division Master Mechanic, which position he held for three years. In 1885 he returned to the Boston & Maine as Master Mechanic of the Worcester division, and in February, 1892, was appointed Superintendent of Motive Power and Machinery. He resigned the last named position last December, on account of poor health.

Mr. A. M. Wellington, Editor of the *Engineering News*, and well known as a civil engineer and writer on engineering subjects, died in New York, May 23, from heart failure. We are informed that in 1892 Mr. Wellington became interested in the subject of thermodynamics, and as the result of his studies invented an entirely new system of transforming heat into mechanical work, designed to effect this transformation with much smaller percentage of loss than the best existing steam engines. He devoted his best energies to the engrossing task of developing this invention, and labored so incessantly that his health failed under the strain imposed upon it. He had practically completed his invention, however, before this time, and was only awaiting the hoped-for restoration to health to undertake its commercial development. Early in life he was engaged for more than 20 years in miscellaneous engineering work, principally upon railways In 1881 he was made Chief Engineer of the Mexican Central Railroad, and he spent the five years following in the service of the principal Mexican railways. He was Chief Engineer of the Interoceanic Railway, from Vera Cruz to the City of Mexico and the Pacific Coast, and Assistant General Manager of the Mexican Central Railway. His principal literary effort was in writing the "Economic Theory of Railway Location," a very valuable work adopted as an authority in civil engineering circles.

Cast Iron Stacks.

Writing to us about cast and wrought iron smoke stacks, Mr. George B. Hazlehurst, General Superintendent Motive Power of the Baltimore & Ohio Railroad, says, referring to the article in our April issue describing and illustrating the cast iron stacks used on the Baltimore & Ohio:

"There is one point about this stack that I omitted to state in writing to you about it originally, and that is, the base shown is the same for all stacks, and we can, in a few minutes, substitute any one of the number of different sizes, they being entirely interchangeable. We have four sizes of stack in use, but only one base."

A Good Record.

A comparative statement of the motive power department of the "Big Four" road for the years ending Dec. 31, 1893 and 1894, shows a saving in favor of the latter year as follows: Payrolls, $67,004.92, or 5 per cent; material purchased, $99,974.66, or 15 per cent.; oil and waste purchased, $26,957.88, or 26 per cent.; coal purchased, $123,912.65, or 13 per cent. The results have been obtained with an increased freight car mileage of 2 per cent. We are informed that these figures are correct. It is a most gratifying showing and highly creditable to the ability of Mr. William Garstang, the Superintendent of Motive Power of the road. With an increased car mileage, and therefore increased work for his department, reforms were adopted that accomplished savings aggregating over $318,000. This is a sum that might very easily stand between a receivership and the continued prosperity of a railroad company. It is the most striking instance that has come to our knowledge, showing how much depends on the skillful administration of the mechanical department of a large railroad. We have known railroad companies to be plunged into the hands of receivers that at the time we believed were materially assisted in that movement by reckless management in the locomotive department. We are convinced that our conclusions were correct. We are not speaking of this matter particularly to draw attention to Mr. Garstang; he is an exceedingly modest gentleman, and is not anxious for fame, and as President of the American Railway Master Mechanics' Association he needs none, but our object is simply to show how much depends on wise and careful management of a department that is too often considered as hopelessly expensive, and how much can be accomplished by careful and judicious supervision.

Weights of Sheet Metal.

It will be interesting to those who have anything to do with sheet iron, boiler plate or similar material to have an easily-remembered rule for finding the weight per square foot of material they are working with. The fact that a square foot of iron plate $\frac{1}{8}$ inch thick weighs almost exactly 5 pounds, forms at once a basis for a very simple and easy rule. As a square foot of iron $\frac{1}{8}$ inch thick weighs 5 pounds, a square foot $\frac{1}{4}$ inch iron will weigh 10 pounds, and we can say that the area of any sheet iron (or iron plate) in square feet multiplied by the thickness in one-eighths and multiplied by five will give the weight of the piece. There is a piece of tank iron $\frac{5}{16}$ inch thick, 3 feet wide and 5 feet long, how much does it weigh? The area will be 3 feet by 5 feet, or 15 sqare feet. Now, how many eighths is $\frac{5}{16}$ inch? Since $\frac{1}{8}$ inch equals $\frac{2}{16}$ inch, and two is contained in five two and a half times, we say $\frac{5}{16}$ inch equals two and a half eighths, or two and a half times 5 pounds equals $12\frac{1}{2}$ pounds per square foot, and as there are 15 square feet we have 15 feet by $12\frac{1}{2}$ feet equals 187.5 feet. If it is desired to use this rule for other than iron, we simply find the difference between the weights of the two metals per cubic inch and find what a square foot $\frac{1}{8}$ inch thick will weigh, then work as shown above.—*The Practical Engineer.*

The lubricating arrangement in the new power house of the Electric Transit Company in Chicago is interesting as well as economical. The oil is distributed to all the bearings from a reservoir, in which it is kept under an air pressure of about 15 pounds per square inch by means of a Westinghouse pump, such as is used on a locomotive. From this reservoir the oil is carried through a system of piping to all the cups, which are provided with adjustable sight feeds. The waste is returned by gravity to a filter placed in the basement; after being purified in this filter it enters large storage tanks, whence it is lifted by air pressure to the distributing reservoir to be used over again. Small filters are also placed in the main pipe just below the distributing reservoir to insure the oil being perfectly clean before reaching the bearing.

The Largest Bells.

The largest bell in the world is that in the Kremlin at Moscow. It is over 19 feet in height, and measures nearly 23 feet across the mouth; its thickness, at the point where the clapper would strike, is 23 inches; the cost of manufacturing it was about $300,000. The largest bell in America, it is said, is that in the cathedral of Montreal; it weighs 28,000 pounds. The bell in the city building at Philadelphia is to weigh between 20,000 pounds and 25,000 pounds. There is a bell at Erfurt, Germany, cast in 1479, and one in Notre Dame, Paris, cast in 1680, each weighing 30,000 pounds. The great Chinese bell at Pekin weighs 120,000 pounds, is 14 feet high and 12 feet in diameter.

Opening of the Baltimore Tunnel.

The Belt Line Railroad Tunnel, which has been built under the city of Baltimore from Camden station to Bayview Junction, on the Philadelphia division of the Baltimore and Ohio Railroad, a distance of seven and a half miles, was formally opened for business May 1. The first train to make the trip under the new schedule was the Royal Blue Line express. Hereafter there will be no transferring of passenger trains across the Patapsco River.

It was intended to have the electrical equipment of the tunnel completed in time for the inaugural train, but the three electric locomotives had not arrived from the General Electric Works at Schenectady, and coke-burning locomotives were used. The electric locomotives are expected to be in service by June 10.

The tunnel will shorten the passenger train schedule between Washington, Philadelphia and New York. In the Baltimore and Ohio summer schedule, which went into effect May 12, the time of the Royal Blue trains between New York and Washington is reduced to four and a half hours; between Philadelphia and Washington to two and a half hours.

Fir in Car Construction.

Mr. John Hickey, Superintendent of Motive Power and Rolling Stock of the Northern Pacific Railroad, in writing to us on the use of woods in car construction, says: "We have been using Oregon and Washington fir for the past four or five years in all parts of car construction with excellent success. We have used very little spruce, as it is a scarce article on the line of our road.

"Fir is without doubt the strongest timber of its kind in the country, and the fact of its great stiffness places it on a par with oak both in construction of cars, cabs, pilots and tender frames for locomotives. The amount of this timber, of beautiful quality and great length and diameter of logs, is almost boundless along on the Cascade Mountains and the flat lands between the western slope of those mountains and the ocean. Eastern markets are now becoming alive to the importance of this timber, and we have built some long cars recently for the transportation of it east, over our line, from the coast points."

Superiority of American Cars.

"Self praise is half scandal," but when others praise our efforts and criticise their own in evident sincerity we must conclude that we have some excellencies. Mr. Jeremiah Head, the well-known English engineer, in writing recently about passenger cars, said:

"In the illumination of trains, the Pintsch system seems to be superseding all others in the States as well as in England. The absurd oil lamp which still prevails here on many lines, and which is coeval with the reign of Queen Elizabeth, is nowhere to be seen there. In the matter of draughts, which is one on which the comfort and even health of passengers so much depends, the practice in America is superior to ours. The windows of their cars are better made than ours, and fit tighter. The ventilation is regulated by the conductor, who, while he attends to any reasonable request, will not allow an open window in cold weather on the windward side, to suit the whim of a particular passenger, who cares not though he (or she) is annoying others. If some ventilation seems desirable, the conductor opens the window in the after central door, a plan which entails no draught at all. He also rigidly prevents smoking except in smoking carriages, whereby annoyances and disputes of a kind but too common in this country cannot arise. Our own carriages, even first-class, are most efficient cold-catching traps. To pen up one or more passengers, perhaps for several hours, in a small room with two front doors, each of which contains an ill-fitting window, with more or less of an air-plenum outside one of the front doors and windows, and of a corresponding vacuum outside the others, is an excellent way of subjecting them to continuous air currents. In the endeavor to protect themselves from the natural consequences, all travelers on English railways are compelled in wintry weather, even though nominally within doors, to clothe themselves more heavily than they would find necessary if they were battling with a snowstorm outside. Most of us are, however, so accustomed to this state of things, and so little aware that better conditions prevail elsewhere, that we pay our money and bear our burdens without a murmur."

Machine for Finishing Wrist-Pins in Cross-Heads.

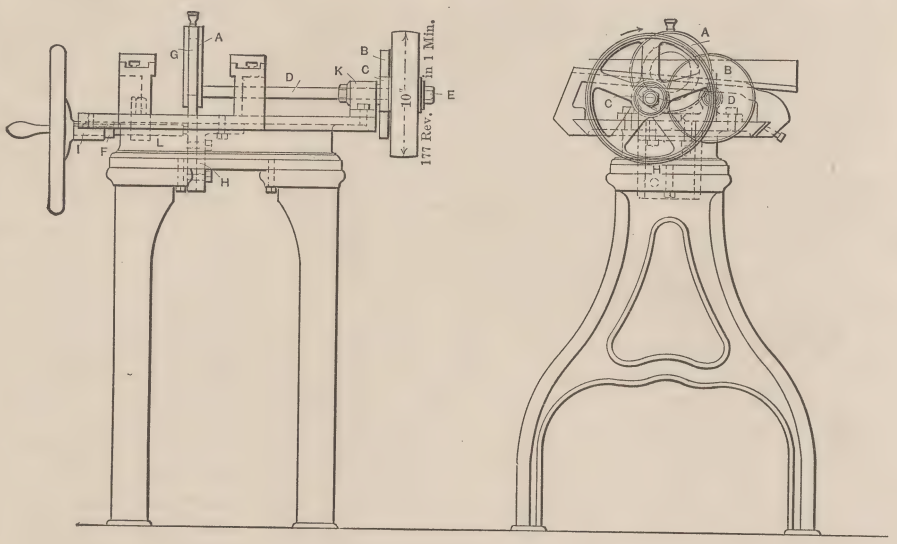
This little machine is designed to perform the work which is usually done by a half-stroke attachment to a lathe, and we recently found it in use in the Springfield (Ill.) shop of the Wabash Railroad. It is a home-made production and has proved itself a great convenience and means of saving labor in this class of work. With the half-stroke machine the results were anything but pleasing; it necessitated the use of a long "goose neck" tool, which could not be made sufficiently rigid, and it often gouged into the metal and broke. This proved specially troublesome with cast-steel crossheads.

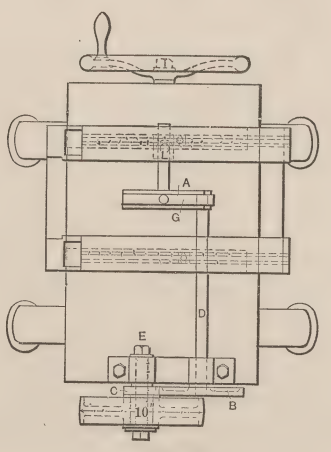
The illustrations of the different parts of the machine are so complete that very little explanation is necessary, but we have been favored by Mr. Barnes' permission with the following by the Chief Draftsman of the motive power department of the Wabash Railroad, Mr. M. R. Coutant. The crosshead is clamped by the wings to the adjustable slides in the proper position, the top half of box *G* and gear *A* first being removed. The gear *A* has recesses in each side to receive the tools, the vertical feed of these tools being governed by the small screws which come between two teeth in the face of the wheel and are operated by a small screw-driver.

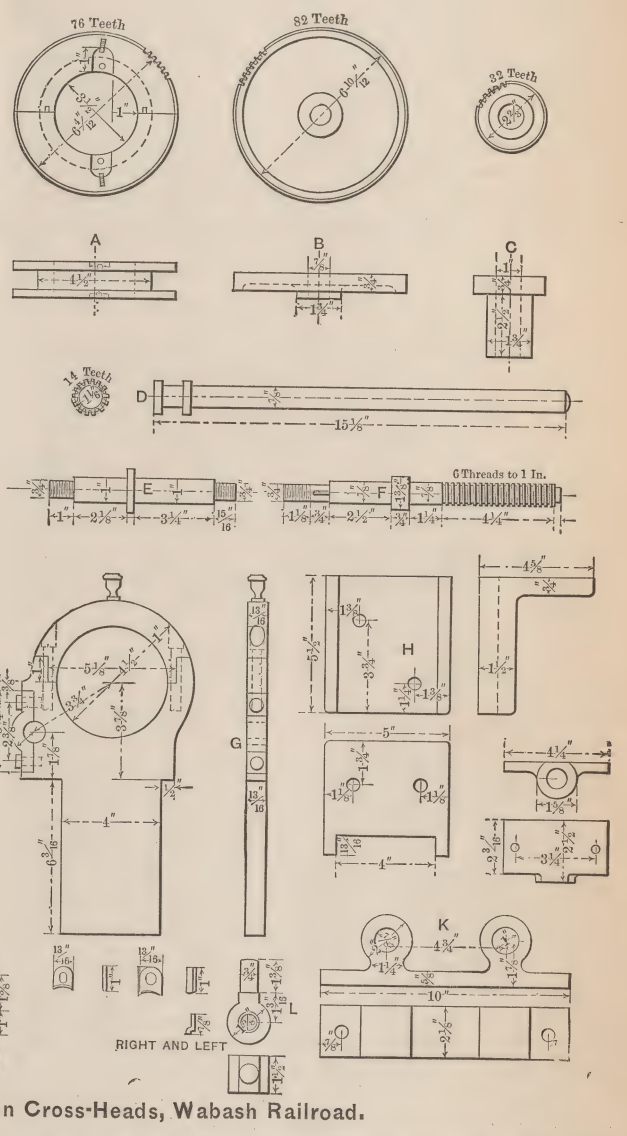
The action of the tools is obtained by belt power at the band wheel, which is keyed on the extension hub of gear *C*, and the whole revolves on the stud *E*. Gear *C* engages gear *B*, which is keyed on one end of shaft *D*. The other end of shaft *D* forms the small gear, as shown, which in turn engages the tool holder gear *A*. The crosshead, being set in position and fastened to the slides, is fed to the tools by the hand wheel and screw *F*; the screw *F* engaging in a nut *L*, which is made a part of the adjusting slides and table. The box *G* is bolted to the bracket *H*, which in turn is bolted to the under side of bed plate.

No actual tests have been made to ascertain the difference in time of the two methods of finishing wrist-pins, but some shop data may prove interesting. With the half-stroke lathe attachment the time required to finish a wrist-pin varies from four to ten hours per crosshead, the best that has ever been done to our knowledge being six crossheads in 24 hours. With the wrist-pin machine two cross-heads are done in five hours without any special effort being made. The time named for the six crossheads done on the half-stroke lathe attachment does not include the time consumed in applying and removing the attachment to and from the lathe nor the time required to lay off and drill the centers. Thirty per cent. is a very modest estimate of the saving in time effected by the use of the new machine, and when a crosshead comes from this machine the wrist-pin is absolutely round and smooth and the hubs are faced square with the pin.

This very handy tool is unpatented, and is, therefore "free for all."







Machine for Finishing Wrist-Pins in Cross-Heads, Wabash Railroad.

A Substitute for Gage Cocks.

As a substitute for the ordinary gage cock, which necessitates the use of three or four of them to indicate the level of the water in a boiler, and even then do not show it exactly, M. Emile Hafner has devised a cock, which will, by a single movement, accurately gage the water. It is described in *La Metallurgie*. It consists of a vertical shell, pierced through and through with lateral slits which communicate on one side with the boiler and on the other with the free air. The plug of the cock is pierced in a helicoidal direction with a series of orifices corresponding with the slits in the shell, and which, in turning, are successively presented before the slits. By turning the key of the cock from right to left the upper orifice is unclosed and allows steam to flow; by turning farther the second orifice from the top is opened and the top one is closed; and so on to the bottom. Rotation is continued until a jet of water flows out, when the key is turned from left to right, closing the cock. A small brass tube of special form to receive the stream of water is placed before the cock, removable at will.

The Chicago, Rock Island & Pacific General Passenger Agent states that the road is reaping more revenue from its lines into Texas than from those into the Northwest.

The Pennsylvan a Railroad is keeping a strict watch over all its employees when not on duty, and those who are found to be frequenters of drinking saloons will be dismissed.

President Dias, of Mexico, has promulgated a special law regarding better protection of railroad trains from the petty attacks which they sometimes suffer, including stoneing in country places, where police protection is not always available. The same law decrees spec al terms of imprisonment in the case of the many small robberies committed in the theft of ironfittings and other articles from the roads and their equipments.

Planished Iron for Locomotive Jackets.

We have before referred to the use on some roads of cheap painted or japanned sheets for locomotive jackets. It now appears that the movement in that direction has not been of the important character which was anticipated when it was first perceived. Many railroad officials are of the opinion that the use of planished iron is much more economical than cheaper sheets, even though the first cost is much greater. Commenting on this matter the *Iron Age* says that it may not be known generally that the continued high cost of planished iron is owing to its very high cost of production. The method of manufacture has not been changed, because it has not been found possible to change it. Although steel is now very cheap as compared with charcoal iron, and has driven iron out of the market in many lines, steel cannot be used in the manufacture of planished sheets. They are made of charcoal iron precisely as in the days when the use of charcoal iron was quite common and when the planished process was perfected. By this process no acid whatever is used, the sheets are not pickled, but the scale, if there is any, becomes a portion of the surface, forming a protecting oxide. This process has not succeeded with steel up to the present time, notwithstanding numerous expensive experiments. Therefore planished iron is still planished iron and not steel, and its uses are growing instead of diminishing.

The Panama Railroad enjoyed a considerably increased business in 1894. The permanent way is reported to be in good condition, 7,196 lignum-vitæ cross ties having been placed in the track and sidings last year; 500 tons of steel rails, weighing 60 pounds to the yard, are, however, still needed to replace light or defective rails.

It is announced that the engineering department of the New York, New Haven & Hartford Railroad has prepared plans for four-tracking and the elimination of grade-crossings on the Providence division as it enters Boston. The cost of the work will amount to several million dollars. The roadbed will be lowered by excavation for a distance of five miles. Along the route there are to be several new suburban stations.

A fire at the base of Mount Washington May 23 destroyed three engines, three passenger cars, the carhouse, engine-house, water tank, machine shop and the station of the Mount Washington Railway. The loss is $50,000. It will be difficult to replace the engines and cars before summer travel begins. Four engines and three cars were saved.

It is announced that the Mexican National Railway Company will remove their extensive shops from Laredo, Tex., to Monterey, Mexico, within a few weeks' time. The shops at Laredo were erected a few years ago at a cost exceeding $500,000.

Damages to the amount of $12,120 has been awarded the widow of a man killed by a mail bag flung from a passing express train on the Pennsylvania Railroad, at Rahway, N. J.

A Tribute to Steam.

In an address to the Detroit Chamber of Commerce, May 2, Mr. George R. Blanchard said:

"On July 4, 1826, Charles Carroll, of Carrollton, then the last surviving signer of the Declaration of Independence, laid at Baltimore the cornerstone of the first chartered American railway. Forty-one years later a golden spike driven on a Wyoming summit, marking also the summit of American commercial achievement, united rails touching the Chesapeake with those of the wharves of the Golden Gate. We had built a new path for old nations.

"Steam had no heraldic lineage, but it has become the embassador of nations and the field marshal of the world. From the song of the kettle, which, as steam lifted its lid, inspired Watt, to New York Central engine 999, the problems it has created have been conned, wrought and solved with a patience, brilliancy and carrying security which have entitled railway projectors, builders and administrators to public and commercial appreciation and legislative consideration. The compass and the throttle bar have become the crown and sceptre of commerce, and through bills of lading, letters of credit and coupon tickets have replaced letters of marque and passports. The locomotive bell has become the earth's liberty bell. Its boiler holds the most potent force of civilization; its wheels are the wheels of progress; its headlight is the illuminator of undeveloped districts. Their whistles are the huzzas of the nations, and they sound to-day in Jerusalem after fulfilling the Divine injunction to carry glad tidings to all the people."

An Incandescent Gas Burner.

Public attention is being given in Paris to a system of incandescent gas lighting to which the name of the inventor, M. De Mare, has been given. The arrangement consists of an atmospheric burner-fitting designed to be easily attached to an ordinary burner point. This fitting is of extremely ingenious design and construction; being probably the smallest and most compact air and gas mixing apparatus ever successfully used for this purpose. It is professedly designed upon the principle of the Giffard injector. The mixed gas and air issue at the top of the fitting through a slit, which causes the flame to spread in the regular batswing shape. Across the flame is suspended, by means of a brass yoke, a length of twisted platinum wires carrying a row of what appear to be asbestos fibers. In the heat of the atmospheric flame these fibers become highly incandescent, and yield a brilliant light. The effect is certainly striking; and as neither chimney nor globe is required to enable the light to burn satisfactorily, and the incandescing material is not woven into any textile form, the simplicity and cheapness of the arrangement are obvious. For street lighting, clusters of these burners are used in Paris with good effect. Before lighting, the fibers, being flexible, will stand any reasonable amount of handling; and it is said that one string will last for 1,500 hours of lighting, and be serviceable to the last shred. The consumption of gas is limited to 2⅜ cubic feet per hour; and the illuminating power is stated to be 25 candles.—*Scientific American.*

Communications.

An Argentine Boiler Explosion.

Editor National Car and Locomotive Builder:

In my correspondence to you regarding the explosion of this locomotive, and published in your issue of December last, I acquainted you with the most general version respecting the accident. The lack of water in the boiler and their having operated the injectors at a time when the firebox was overheated, produced a rapid vaporation in consequence of the cold water in contact with the metal in an incandescent state. (Theory of Dufaure in regard to the spheroidal formation of vapor.)

In the January number of your important journal, I have seen the reply to the criticism made by the *Railroad Gazette* in regard to this opinion.

In order that it may not be believed that I have given my own judgment, I shall herewith give more details for explaining causes which in my judgment produced said accident. But first I ought to have it made clear that the theories of Defaure have not been put aside in so complete a manner as to judge them inapplicable. I will also note that by the very fact of the explosion the amount of pressure in the boiler at the moment of the explosion remains a mystery. This is merely, as I indicate above, the most general opinion which has reached me, but under no circumstance my personal opinion; for, from the very commencement, I have thought that the excess of pressure due to the negligence of the engineer, and also condition of the boiler (which I learned was not frequently and thoroughly cleansed, on account of the bad quality of the water, which contains a great amount of saltpeter, thus producing thick inscrustation), surely caused the destruction of the metal sheets of the firebox. It should also be considered that the locomotive had come out of the workshops a few days before, having had a general repairing; and also, before entering on the general traffic of the line, had been in the hands of the contractor, on the extension of the line, and on being received by the engineers of the company its state of preservation was extremely bad, as the walls of the firebox were completely covered by a very thick incrustation of saltpeter, owing to the negligence of the said contractors. This confirms my opinion, in the second place; and, as for the first, it has been confirmed by the engineers of the Central Cordola & Northwestern Argentine Railroad. Whether the steam gage of the boiler was correct or the safety valves allowed escape on reaching the maximum of pressure authorized, I am not informed, as these details remain unknown. It is naturally to be supposed that if the pressure authorized was 190 pounds per square inch, very little more pressure was needed for the explosion to take place if account is taken of the antecedents which I cited. The fireman of the locomotive, who by accident was away at the moment of the explosion, says that prior to it he had started the injector on the left side and that the pressure indicated by the gage at the time was 120 pounds. A few days ago there resulted the summary of the investigation; the company discharged from its employ the manager (or foreman) of the shops, Mr. Preiswerk, without making public the reason for it.

AN ARGENTINE.

Protection of Wire Ropes.

Editor National Car and Locomotive Builder:

In the NATIONAL CAR AND LOCOMOTIVE BUILDER for May we find a very interesting article on "The Protection of Wire Ropes." This subject is one that we have been interested in for a number of years and we quite agree with all writers that a wire rope should be protected with something that will lubricate all of its various strands in order to prevent abrasion as the position of the rope is changed, and that at the same time whatever is used should equally protect the strands from rusting. We note that a lubricant is suggested made of tar, summer oil and mica axle grease in such proportions as will meet the special conditions under which the ropes are to be used. It is added further that the tar and oil must be free from acid. Now it is almost impossible to obtain anywhere tar and oil that are free from acid; there is almost always present in the tar, a corrosive acid which in time will attack the strands of a wire rope and serve to hasten destruction. Mica, and a good lubricating grease we think would prove far better for use without the tar and oil, but there is a substance infinitely superior to mica, as a lubricant and a preservative. We refer to flake graphite.

Graphite is without question the best solid lubricant known. It has a peculiarly strong affinity for all iron or steel surfaces, and when mixed with the proper grease or lubricant and applied to a wire rope the little thin flakes of graphite work in and around all the strands and become fixed like a veneering, to the several strands, enabling the strands to glide over each other easily and protecting them from rust and abrasion. We have testimonials of mining engineers and others that for the preservation of wire ropes in mines and in quarries, a properly made graphite grease has been found superior to all other articles ever tried.

JOS. DIXON CRUCIBLE COMPANY.

Mr. Duane Doty, in a recent article on Pullman car trucks, states that the standard six-wheeled truck of that company contains 1,929 pieces of wood, iron and steel.

Apparatus for Producing Intense Cold.

In the regard to the use of liquid carbon dioxide for chilling test pieces, especially iron and steel, at low temperature M. Haller writes in the *Industrie Zeitung* that a cheap and simple form of apparatus in which the test specimens could be cooled consists of a wooden box with double walls, top and bottom, the spaces between being filled with some non-conducting substance; the liquid gas being led into such box from the iron and steel flasks in which it is furnished, and would be deposited in great part in the form of frost at a temperature of about 44° below zero, Fahr., and the test specimens could be readily put into and taken from such a box, and would quickly get to a low temperature. One of the Russian railroad companies is on the point of having such an apparatus constructed in order to test rails and wheel tires at low temperature. The practicability of accomplishing the desired object with such an outfit, viz., the rapid freezing of specimens, has been demonstrated by putting a number of iron test pieces into a bag of several thicknesses of coarse cloth and then introducing the liquid gas; the latter at once became solid and filled all the spaces between the specimens, which thus lay packed in snow; each specimen was provided with a depression into which mercury could be poured, and on doing this, after a short exposure in the freezing bag, it was found that the mercury immediately solidified, showing that the temperature of the specimens was certainly below 20° below zero, Fahr.

Early Iron Casting.

The early history of iron casting was discussed by Dr. L. Beck, of Biebrich, in a paper read by him at a recent meeting of the German Ironfounders' Association, held in Wiesbaden. In 1708, says Dr. Beck, the Quaker Darby patented the system of box-casting, and in the following year started the famous Coalbrookdale Foundry, which, in 1780, turned out the first cast-iron bridge. About the same time malleable cast iron was invented in France, and was much advanced by Reaumur, who also perfected the portable shaft furnaces (Schachtofen), and which must be regarded as the forerunners of the Bessemer converter, and by means of which the casting of iron was emancipated from the blast furnace process. The English cupolas, first mentioned in 1764, were of German origin; and fresh impetus was given to iron casting for the production of dense cast-iron cylinders by the invention of the steam engine.

The Longest Canals.

The Imperial Canal of China is over 1,000 miles long. The Canal of Languedoc, or the Canal du Midi, connecting the Atlantic with the Mediterranean, is 148 miles long. It has more than 100 locks and about 50 aqueducts. Its highest part is 600 feet above the sea, and it is navigable for vessels of upward of 600 tons. The great North Holland Canal is 125 feet wide at the water surface, 31 feet at the bottom, and has a depth of 20 feet. It extends from Amsterdam to the Helder, 51 miles. The Caledonian Canal in Scotland has a total length of 60 miles, including three lakes. The Suez Canal is 88 miles long, of which 66 are actual canal. The Erie Canal is 350½ miles long; the Ohio Canal, Cleveland to Portsmouth, 332; the Miami and Erie, Cincinnati to Toledo, 291; the Wabash and Erie, Evansville to the Ohio line, 374; the Manchester Ship Canal, from Manchester to Eastham, 35½ miles long.

The Work of the Heart.

Poets and philosophers are fond of marveling at the wonders of the human heart, but they usually confine themselves to homilies on its ceaseless activity, and some of the things that are most wonderful of all escape their attention entirely. One of the most remarkable things about the heart is the amount of the work it does. Considering the organ as a pump, whose task it is to deliver a known quantity of blood, against a known "head," it is easy to show that in 24 hours a man's heart does about 124 foot-tons of work. "In other words," says a contemporary, "if the whole force expended by the heart in 24 hours were gathered into one huge stroke, such a power would lift 124 tons one foot from the ground. A similar calculation has been made respecting the amount of work expended by the muscles involved in breathing. In 24 hours these muscles do about 21 foot-tons of work."—The *Locomotive*.

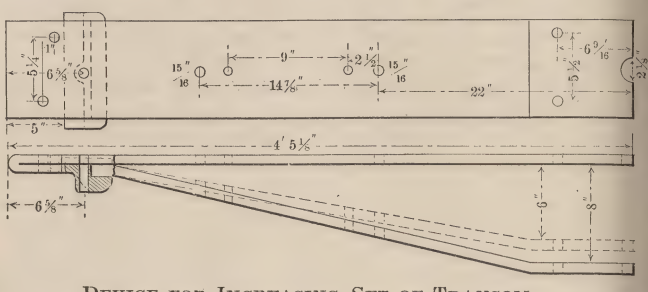
The damage to watches from being magnetized by a dynamo results from the main spring, which is tempered, becoming a magnet, and, as it unwinds, its attraction, varying in direction or intensity, causes the rate of escapement to vary at different hours of the day.

The Interoceanic Railroad of Mexico had another disastrous wreck at Tememata, where 65 passengers were killed Feb. 26. The last wreck involved a freight train, and 14 persons were killed.

A special passenger train of three cars was run over the Baltimore & Ohio from Philadelphia to Washington a few days ago in 2 hours 22 minutes. This is said to be the fastest time ever made between the two cities. The distance is 135 miles, which make the average speed 57 miles an hour.

Device for Increasing Set of Transoms.

The following engraving reproduces a drawing sent to us by Mr. M. B. Schaffer, Master Car Builder of the Missouri Pacific Railway, at St. Louis. It shows a device for increasing the set of the bottom half of 8-inch box-car transoms, consisting simply of a small iron casting placed about six inches from the ends, as shown in the drawing. While this is a very simple arrangement, it is proving to be quite an improvement, and aids materially in the easy riding of



DEVICE FOR INCREASING SET OF TRANSOM.

cars, and in reducing resistance on curves, as there is less trouble from cars going down on their side bearings and interfering with the full movement of the trucks.

In our issue for April, 1894, we illustrated and described Mr. Schaffer's design of steel-car and tender-truck bolsters, as used on the Missouri Pacific. These bolsters are very largely used on that and several other roads, 200 per month being applied under Missouri Pacific cars.

Chicago & Northwestern Track Elevation in Chicago.

The elevation of the tracks of this railroad in Chicago promises to be as interesting to engineers as it is necessary to the safety of the people of that city. Work on the first section was begun about a month ago, and embraces the elevation of five tracks for a distance of about 1.85 miles and the construction of six heavy girder bridges over as many streets. The work is to be carried on in such a manner that but one street and three of the five tracks will be closed at a time. To do this the embankment for the elevated track is to be commenced on either side of the street, which will be left in the low place between two inclines of one foot fall in 100 feet horizontal distance. These inclines will be built of the full width of the proposed embankment, and all five tracks are to be carried up with them. When they are finished, rows of piles will be driven at each side of the street strong enough to support the girder bridges temporarily. These girders will be all riveted up in the yard, with the floors for three tracks connected to them. When finished they are to be transported to the street crossing on flat cars and raised into place by jacks. Then the three tracks connecting with the rails carried by these girder spans will be raised as quickly as possible, and when they are in a condition to carry trains the two remaining tracks will be closed, the rest of the iron work of the bridge finished, and the whole system of tracks over the bridge completed. The permanent abutments will then be started and carried up as the embankment is formed, until the entire track system finally reaches its proposed elevation. When this work is finished the tracks at the next crossing will be raised in the same manner. This method offers the advantage to the people of closing but one street at a time, and to the railway of leaving at least two tracks in service.

Epithets for Chauncey Depew.

The genial president of the New York Central is having some fun just now over newspaper comments on his recent speech in Detroit, when he so severely arraigned the free-silver advocates. Recently he said:

"Ever since that speech was printed, or perhaps delivered, I have been receiving hundreds of papers which are known as silver organs, in the columns of which I have been severely attacked for my utterances on that occasion. They are remarkably fertile in epithet, but singularly barren in argument. I have tried to make a complete list of the comments of the different papers I have received. From what I have compiled I learn that it was 'shallow,' 'puerile,' 'weak,' 'ignorant,' 'transparent,' 'chimerical,' 'fallacious,' 'the product of a bigoted region.' I am a 'goldbug,' a 'goldite,' a 'goldfish,' a 'monopolist,' a 'lobbyist,' a 'representative of the besotted East,' 'all surface and no depth,' a 'talker but no thinker,' a 'millionaire doctrinaire,' and some twenty other lurid things. I could survive with comparative cheerfulness all these things had not a California newspaper provoked me by calling me a 'saucer.'"

A New York Central trackman was greatly horrified and incapacitated for work for several hours on May 18, when he was aroused from his *siesta* by feeling a snake crawling into his trousers' pocket, and on through a hole in this to his leg, from which it was only dislodged by assistance from his companions after a protracted and terrifying interval.

A company is now in process of formation for the building of a ship railroad from Bordeaux to Narbonne, or from the Bay of Biscay to the Mediterranean. The line will be a little less than 300 miles long, and is estimated to cost considerably less than the ship canal project. The time transit will be only one-fifth as long.

The Efficiency of Compound Locomotives.*

BY F. W. DEAN.

Long since used in engines for all other purposes with marked success, the compound principle in using steam was unused in locomotives until recently, especially in this country. Of late, however, the country has been somewhat flooded with compounds, some of very inferior designs. The result of this has undoubtedly been to cause a reaction; several compounds have been changed to simple engines, and many railroad men are either in a skeptical state of mind or condemn such locomotives in an unqualified manner. Wherever this condition exists, it can always be traced to an experience with the locomotives having such bad qualities that their use was simply intolerable. Fortunately, there are a sufficient number that are proving to be unobjectionable, and are so highly advantageous in many ways that their continued use is assured and will be gradually extended. A type of engine that can clearly save fully one-quarter of the coal now used by simple locomotives, that materially reduces water consumption, diminishes boiler and slide valve repairs, reduces smoke, cinders and the fire risk, that steams better than the simple engine in hard places, without a necessary increase of any kind of repairs, must surely become the favorite as soon as people know which design to select.

Your committee has asked me to speak particularly of the *efficiency* of compound locomotives. This I propose to do briefly and as clearly as possible, and I shall begin with a statement of the reasons why a compound locomotive that is properly designed will save steam compared with the best simple locomotive, no matter what kind of service is considered.

1. The steam can be more conveniently used with great expansion, and therefore high steam pressure can be more advantageously utilized.

2. Division of the expansion between two cylinders diminishes condensation in both cylinders by reducing the range of temperature in each cylinder.

3. Division of expansion between two cylinders renders it possible to evaporate or reheat a portion of the moisture in the exhaust of the first cylinder, and thus render it capable of doing work in the second cylinder. As this can be done in the locomotive with waste gases the gain is all profit. By using the proper kind of receiver this is an effective means of economy.

4. Steam that leaks through the valve of the first cylinder is, in a properly designed locomotive, worked expansively in the second cylinder.

5. Steam that is re evaporated toward the end of the high pressure piston stroke, too late to work expansively, instead of being exhausted to the atmosphere as in the simple locomotive, is worked expansively in the low pressure cylinder.

Concerning the first reason, the expansion in the compound locomotive can be secured with a later cut-off than in the simple locomotive, and with this comes a wider port opening and less wire drawing of the steam. It is feasible to expand steam in a single cylinder by cutting off early, but such efforts have always resulted in wastefulness by great condensation, thus giving rise to the familiar expression "expansive working is expensive working." D. K. Clark showed as early as 1850 that a cut-off of about one-third stroke in a simple engine is the most economical, and the same thing has been recently shown by Prof. Goss in this country. So that if a high degree of expansion is used in the simple locomotive it means extravagance in steam, although it may save some coal by low terminal pressure and gentle exhaust action on the fire. The compound locomotive, however, saves 15 to 20 per cent. of steam, and above this saves coal by its low terminal pressure and gentle exhaust.

Concerning range of temperature, in certain typical cases in my possession the temperatures and ranges were as follows:

Simple.		Compound.			
Initial temp....	374 degs.	H. P.	368 degs.	L. P.	312 degs.
Lower.....	230 "	"	298 "	"	230 "
Range.....	144 "	"	70 "	"	82 "

In these cases the simple locomotive used 27½ pounds of feed water per indicated horse-power per hour, and the compound 19½ pounds, producing a saving of 29 per cent. This remarkable saving is attributable only to the small ranges of temperature in the cylinders with resultant small condensation, and to the reheating receiver, for the total expansion was the same in both cases.

In simple locomotives the condensation in cylinders sometimes amounts to as much 60 per cent. of the total steam used, and in the case of a simple locomotive with which I have experimented, where the passages were well protected, the condensation was 38 per cent.

The effect of a re-heater is rather difficult to determine in a locomotive, and of course no rise in temperature or superheating would be shown until all of the moisture had been converted into steam. As there is much moisture in exhaust steam it is not likely that it will be all dried out by the receiver of a locomotive. In a pumping engine, however, such difficulty disappears, and in a Leavitt pumping engine at the Boston Water Works, while the pressure in the low-pressure steam chest was equal to that of the atmosphere, the temperature, instead of being 212 degrees, was 306 degrees, showing the remarkable superheating of 94 degrees. As a compound locomotive receiver is bathed in gases of 550 degrees to 600 degrees, while the temperature of the moist steam within has a temperature of only some 280 degrees, it is unnecessary to argue that some re-evaporation takes place. When we remember the great capacity of the metal of a steam cylinder to condense and re-evaporate, we have ample reason for the belief that a receiver having a temperature fully 200 degrees higher than that of any locomotive cylinder, has a much greater capacity for evaporating moisture than a cylinder. It is clear, from these considerations, that a receiver in the smokebox of a locomotive is of the greatest importance in promoting economy.

In the fourth reason for the economy of a compound locomotive I have stated that the leakage by the high pressure valve should pass into the low-pressure cylinder, and there worked expansively. This is necessarily so in the two-cylinder engine but in some four-cylinder locomotives, with a single valve to two of the cylinders, leakage may pass directly from the high pressure cylinder, or even the boiler, to the atmosphere.

While I have pointed out the economical advantages of compounding, I must not ignore the losses to which the compound is subject. These losses have in cases converted compounds into more wasteful engines than simples. I will take up these losses as they occur. The first is that due to the imperfections of the link motion which are strongly brought out in the high-pressure cylinder. These imperfections are great in simple engines also, notwithstanding the protestations of some of my locomotive friends, but in the high-pressure cylinder of the compound, as compression begins on steam of receiver pressure, compression is likely to be excessive, and reduces the area of the indicator diagram seriously, and in early cut-offs at ordinary speeds, even, a loop is frequently formed showing negative work, thus reducing the net work. This is one reason why many compounds at certain points of cut-off do much more work in the low pressure cylinder than in the high. It also furnishes a part of the reason why some compound locomotives are less economical, in relation to the simple engine, in light work than in heavy. In the latter case the point of cut-off is sufficiently late to avoid excessive compression and a loop in the diagram. The usual remedies for this defect are inside clearance to the slide valve, and large clearance volume in the cylinder The former causes the exhaust to close later, thus trapping in less steam in the clearance spaces, and the latter gives a larger volume to fill by compressed steam and thus reduces the maximum pressure. There is another remedy that ought to be applied in addition, as follows: The high pressure valve should be set so as to give negative lead in fall gear, and to give zero lead when cutting off at about 45 per cent. of the stroke. Slipping the eccentrics back sufficiently to accomplish this delays the beginning of compression, and therefore its maximum amount.

Another loss, which is often great, is that between the cylinders, causing the combined indicator diagram to have a large gap between the bottom of the high-pressure and top of the low-pressure cards. This loss is so great in many cases as to amount to some 30 per cent. of the possible work of the steam after high-pressure release, and will nullify all gains that may come from compounding. It is probable that less than half a dozen compound locomotives in the country have this loss so small as to make it, when coupled with another phenomenon, virtually nothing. The loss between the cylinders is so insidious, so to speak, and so little comprehended, that it should be dwelt upon sufficiently to make its causes and nature clear. It cannot be done away with, even in slow running pumping engines, for even there some work must be absorbed in transferring the steam from one cylinder to the other. In addition to this cause the various resistances produced by obstructions and abrupt changes in direction of the steam passages are to be noted. The steam in passing out of the first cylinder, through the intercepting valve, where this is used, and through the open port of the low pressure cylinder, is considerably retarded and a great loss of pressure is produced. Engines having piston-valves suffer much from this loss because the steam has to pass through gratings which form the ports. Engines that have the intercepting valve on the low-pressure side are much subject to this loss, because the steam is rapidly drawn from the receiver by the low-pressure piston through this restricted opening. If this valve is on the high-pressure side the steam passes through it only as rapidly as it escapes from the small cylinder, and this is only some one-half to one-third as rapidly as it is drawn into the large cylinder. This shows the importance of placing the intercepting valve as near the high-pressure cylinder as possible. The type of engine that can be used at will as a simple engine, is in general considerably subject to this loss, for the changing valve forms tortuous passages and abrupt obstructions when the engine is compounded. In this case also, the valve should be near the high-pressure side.

I should not omit to notice a loss seldom thought of, viz., that due to the back pressure on the low-pressure piston. This piston always has a larger area than the combined areas of the two pistons of the equivalent simple engine. Unless the back pressure per square inch on the low-pressure piston is less than on the simple pistons, in proportion to the greater piston area, it is evident that the work of the back pressure is greater in the compound than in the simple engine. In general, I think the back pressure will be found to be proportionately less than in the simple engine, but this possible loss should furnish caution against over-cylindering a compound locomotive, especially on the low pressure side, and particularly for high speeds. This is an argument for obtaining large power by means of large high-pressure cylinders, and indirectly for the cylinder ratio of 2 to 1, or thereabout, for a passenger engine.

Having considered all the losses to which a compound is subject, we are in a position to appreciate the reason why certain compound locomotives are highly economical, when working slowly or even moderately fast, with heavy trains. In these cases in consequence of late cut-offs, yet with considerable expansion, and somewhat slow movement of the steam, the losses decribed are small and bear a small proportion to the total work done. The result is that the compound is enabled to bring out those valuable qualities undiminished, which in numerous cases it has proved itself to possess. Most compound locomotives have a low-pressure port ridiculously small, so small, in fact, that while simple engines require an extravagant velocity of steam through ports, even as high as 1,500 feet per second, some compounds have it two to three times as great. In such locomotives the loss between the cylinders is enormous, and the engine becomes useless for high speeds. The compensation for the loss between the cylinders, to which reference has been made, is the increase in the area of the low-pressure diagram, produced by the fact that compression should occur only up to an initial pressure in that cylinder. The late exhaust closure fills out the heel of the diagram and may add to its area the amount lost between the diagrams. In my experience the loss between the cylinders at 232 revolutions per minute was only 8 per cent., while in many compounds at this speed it is fully 30 per cent. The above 8 per cent. was exactly made up as just described.

This discussion has brought out the fact that the compound locomotive is subject to losses to which the simple engine is not, and which may render it unfit for fast work. Such defects can, however, be fully overcome by large and easy passages, and the oft repeated statement that the compound is fit only for freight trains is highly erroneous.

From one point of view, compound locomotives can be divided into two classes, viz.: the automatic, that starts by allowing live steam to pass to the large cylinder until the engine has made a half revolution or thereabout; and non-automatic engines, that can be operated at will as simple locomotives as long as desired. I have always taken the position that the non-automatic engine does not allow the compound system to fully realize its object, and that any locomotive which does not immediately become a compound after making an initial movement is to some extent a failure. It is held by the advocates of this type that the automatic engine does not start well, and that it cannot pull a sufficiently heavy train over ruling grades. Neither of these features has come within my experience. It is no exaggeration, in fact, to say that the starting of the automatic engine has been uniformly surer than that of the simple engine in this service. The point here considered is of the greatest importance in suburban orelevated railway work, for here the compound is particularly economical if it is a compound from the beginning. If it is a simple engine for some little time, the greatest part of its peculiar adaptation to the work, which requires frequent starting, is lost.

From another point of view, compound locomotives are divided into two, three, or four-cylinder engines. Here appears a radical difference in detail, and one that must not be passed over without discussion. In designing an engine for any kind of work it is fundamental that the smallest cylinders that will properly expand the steam should be used, and that the smallest number of cylinders should be used. By pursuing any other course more cylinder, piston, and piston-rod surface is obtained than is necessary. As cylinder condensation is the greatest of all enemies of economy, by using multiple cylinders we invite our greatest enemy to be always with us. It is at least approximately true that cylinder condensation is proportional to surface, other things being equal, and dealing with common sizes, the cylinder, piston, and piston-rod surfaces of a four-cylinder compound engine will be found to be about 33 per cent. in excess of those of the two-cylinder type.

Discussion.

Mr. O. F. Nichols, Chief Engineer of the Elevated Railroads of Brooklyn, said that the two-cylinder compound locomotives in use on those lines effected an economy of about 20 per cent. in fuel, but that more care and attention in repairs is necessary with these engines, and probably considerably more expense than with simple engines; also that it requires a great deal more care and skill in running, particularly in elevated railway service.

Mr. Vauclain, General Superintendent of the Baldwin Works, said: "We do not believe that there is any loss in using the piston valve due to the numerous apertures through which the steam has to pass, and the restrictions placed on the free passage of the steam by the bridges in the steam-chest; because, by using the piston valve we are able to get a very much longer length of port than with the ordinary slide valve with very little valve friction. We are also able to operate steam pressures that it is utterly impossible to operate with the ordinary slide valve.

"Mr. T. W. Worsdell was one of the greatest advocates of two-cylinder compound locomotives, and he built a great number for the Northeastern Railway; he has now been replaced by his brother; that railroad has found it necessary to change those engines to single-expansion engines. These very two-cylinder compound locomotives are now being fitted with single-expansion cylinders, and those single-expansion cylinders are being fitted with piston valves, and indicator diagrams taken from those locomotives are far superior to any indicator diagrams I have seen taken from single-expansion locomotives with slide valves. If the length of port is sufficient, if the passage is free, so as to reduce the friction of the steam in passing from one cylinder to the other to a minimum, it seems to me it matters not whether you use a circular valve or a flat valve, and if by the use of a circular valve you reduce your friction to a minimum (much less than what you have in a flat valve), then it seems to me it is desirable to use the piston valve, and in a great many cases the piston valve can be used where it is utterly impossible to attach a slide valve.

"One reason why we went into this system of compounding was that we had inquired thoroughly into the two-cylinder system. But for us to attempt to build an American engine, making it a four-cylinder compound with tandem cylinders, or inside cylinders with crank axles, or anything of that sort, would not have done at all; we would not have been able to find a market for wares of that kind. The idea occurred to me that by placing the cylinders adjacent to each other, one immediately above the other, and connecting the two pistons to a common crosshead, supplying steam to both cylinders by a single piston valve, we could get very good results. If we would have losses in some direction, we would more than compensate for them by economies made in other directions. There would be no alteration to the locomctives, except to the cylinders, outside of the frames, and the guide and crossheads. The internal arrangements, the smoke box, the links, and everything of that sort would be exactly the same as on the single-expansion engines.

"As we are builders of locomotives, and there being no monetary return to me whatever for my system of compounds, we aim to get the very best, whether it is a four-cylinder or two-cylinder compound, or a three-cylinder compound, or a single-expansion engine. We are in the locomotive business and not in the compound business. We have made exhaustive tests of what is commonly known as the Wooten firebox, fitted with compound cylinders, against the same engines fitted with single-expansion cylinders, and effected an economy of about 24 per cent. Another feature came out in these trials, and that was that the compound engine could burn a very much inferior grade of fuel, and the contrast was so great that now the Blue Line trains between New York and Philadelphia are using nothing but what is called buckwheat coal, which costs the company about 35 cents a ton, whereas before they used the best quality of egg coal for the work. The Philadelphia & Reading operates 78 compound locomotives."

* Abstract of a paper read before the monthly meeting of the American Society of Mechanical Engineers, held on May 8.

The Training of Employees.

At the last meeting of the St. Louis Superintendents' Association Mr. H. I. Miller, of the Terre Haute & Indianapolis Railroad, read the following paper on the "Selection, Training and Advancement of Employees":

"It is the bridge with the weak foundation that goes down with the spring freshet. The selection of men for positions on a large railroad system is, in a degree, the laying of the foundation stone for a part of its future successful operation. Whether it be the roustabout, the engine wiper, the coal heaver, the truckman, the student at a remote telegraph office, or the cub on the engineering corps, it is only a question of time until many of them will be holding positions of responsibility, but who, from a lack of education or natural qualifications, will be unable to go beyond a certain point in the continuous line of promotion which the railroad affords. These men must be passed around by others more capable, and they will be constantly in the way; if not passed around they will be forced into positions which they cannot properly fill. Several of the large railroad systems have for years expended annually large sums of money in the testing of materials which enter into their locomotives, cars, buildings, bridges and rails, but how many of them have gone to much expense in the selection of material which enters in the different ranks in the shape of Man. There are certain clays only that are suited to the potter's mold, and so it is with men; not all are adapted to railroad work. In their selection we should consider carefully the man's age, size, physical condition, sense of sight, hearing and smell; his disposition and his history up to date of employment. This information methodically gathered and filed away affords a large number of men from whom to select, always choosing the best fitted for the work and future advancement, regardless of the date of the application. It is the men from the ranks who eventually manage the railroad properties.

"I believe it will be generally found that young men whose families live along the line of the road make the best employees. They have the influence of home and friends to keep them in the right path and encourage them to study in the hope of promotion. The friends of these men are frequently either directly or indirectly interested in the prosperity of the road, and so discountenance strikes. Above all things in the employment of men, avoid tramp brakemen, tramp switchmen, tramp operators, or tramps of any kind. They are the greatest agitators, the greatest demoralizers. They do you much harm and never any good. When men are needed, select from the list of applicants only those who will do themselves and the company credit. At the best, some inferior man will creep in and soon be, by seniority, a conductor or an engineman, or filling some other position where either the responsibility of the lives of passengers or the economical use of the company's supplies will be involved. Do not clog the wheels of the big machine by employing in one branch of the service the man who has made a failure in another. You are in that way filling a position with practically dead timber, when in its stead you might be obtaining a good growth from a capable man. In keeping the man who has made a failure, you are oftentimes doing him an injustice. He might succeed in some other business. Do not promote from the wiper to the fireman, to the hostler and up to the engineman, and then find you have a man who cannot work such simple problems in arithmetic as will enable him to compute time and distance. Avoid this by employing as the wiper the young man with an education. There are thousands of them hunting for the position. Do the weeding out from the applications; it will save you doing it later from the men. This will elevate the standard of intelligence, the standard of morals, and the man, more than the position he is filling, will soon begin to appear above the surface. When it is generally understood that a man who is a bad man for one railroad is a bad man for all, the number of men who are indifferent in their work will be materially decreased.

"As the plant inclines toward the light, so does the railroad employee lean toward instruction, training and development. I have recently had the opportunity of watching the effect of lectures accompanied by blackboard illustrations; lectures by a road foreman, a chief dispatcher and a trainmaster, lasting each four hours, and attended by from 50 to 100 employees. Never have I seen men more grateful for the opportunity to have clearly presented to them many of the problems of train service. They invariably ask, When will the next lecture be?

"The training and development of railroad employees is that part of railroad work which has been given the least attention in the past and which offers the greatest opportunities for the future. We see here and there an isolated case where the individuality of the superintendent is strong enough to enable him to undertake what the majority would either say is impracticable or not worth while. I know of one superintendent on one of the busiest divisions of railroad in the United States who has made himself doubly strong by making one of his principal lines of work that of developing his staff. We cannot improve others without ourselves receiving twice the benefit.

"Many railroads claim to be too poor to have the superintendence which is necessary for the training of men. They make clerks of the trainmaster, of the road foreman, of the chief dispatcher and of the engineer of maintenance of way. Many railroad officers who have never had the practical experience of road work in any of its branches do not understand the advantages of the *esprit de corps* of a good organization. They say organizations are too expensive; whereas, in fact, it is only the rich corporation that can afford to do without a very complete organization. The saving from well-trained, careful men in road and yard work, in overtime, in fuel, in oil, in drawbars and draught rigging, in picking up old material that can be used again, and scrap that can be made over or sold, are some of the places where we will derive great benefit from selection and training. Carefully prepared and bulletined statements of individual performance, whether it be of pounds of coal per engine per mile, or labor per mile of track maintenance, is in the line of training that brings the men all together in one common interest. This requires the intimate knowledge by the head of each department of every man in the department, and this cannot be accomplished if the head of the department is to be a clerk. For years it has been the practice of many railroads, and the custom still exists on some, of promoting through seniority. A great many railroads do this almost without knowing it. Nothing can be more injurious to the service than to promote some man to a responsible position because he has been in the service six months longer than a very much better man. The case is frequently that of the older man being one who is indifferent in many ways to the company's interests; whereas the younger man may be a close student of economy and able to save for the company each year more than the amount of his wages; the former oftentimes studying some means of creating strife and discord; the latter a man thoroughly loyal to the company's best interests.

"The advancement of the railroad employee will soon depend upon his education, his superior fitness for the special work in hand and his knowledge of human nature, together with his ability to use it. In other words, his success in handling men, assisting them to do for themselves what he himself has accomplished. One of the most notable things in railroad work for the last few years has been the remarkable growth of interchange of ideas. Until within a short time it was practically every railroad and every man for himself. The establishing of associations and clubs has resulted in many excellent papers, followed by valuable discussions, until it seems a large part of the fraternity of railroad officers are taking an active interest in this work. With this better education of themselves has come the desire for an improvement throughout the service, as is seen by reference to the proceedings of the officers' associations and clubs throughout the country. The increased values at which all railroad properties are being assessed for taxation, the many increased expenses incurred by greater competition, all tend to increase the cost per passenger and ton per mile. Last year's expenses and earnings on a number of our important systems of road demonstrate that, after using the pruning-knife here, there and everywhere on men and material for two years, the limit has been found, and that in future the reduction in operating expenses below this point must be obtained by economies that can be brought about only by greater efficiency of the same number of men and the same amount of material. For years we have hired experts to cheapen the material by increasing its strength or decreasing its cost of production; much talent is being applied and large expenditures are being made to develop the material both by the railroads and the concerns who have it to sell, but it is left to the railroads alone to develop the men, and this is a comparatively new field.

Victor Hugo's First Railroad Ride.

A couple of years ago we published part of a letter translated from the French, and written by Victor Hugo many years ago, but withheld from print, indulging in some fantastic speculations as to how the people of 400 years ago would have fashioned locomotives and cars if these useful servants of progress had then existed. Since then we have come across a translation of the full letter or article, which is descriptive of Hugo's first ride on a railroad. The trip was taken in Belgium in 1836, and the following is a full translation of his interesting letter:

"I am reconciled to the railroad. It is decidedly beautiful. The first that I had seen was a vulgar construction line; but yesterday I made the trip from Antwerp to Brussels and back. Leaving at ten minutes past four, I was back again at quarter past eight, having in the interval passed an hour and a quarter in Brussels, and made 23 French leagues. It is a wonderful movement, and must be felt before it can be understood. The swiftness is unheard-of. The flowers along the sides of the road are no longer flowers—they are red or white splotches, or rather, streaks. There are no more points—everything has become a streak. The wheat is a yellow mane; the clover has been turned into long green tresses. Towns, steeples and trees dance together and blend crazily on the horizon. From time to time a shadow, a form, a spectre erect, appears like a flash of light outside the door; it is a track-guard, who, according to the custom, presents arms in military fashion to the train. People say on the car, 'It's three leagues; we shall be there in ten minutes.

"In the evening, as I returned, the night was falling. I was in the forward car. The engine blazed before me with a terrible uproar, and great red flashes, which colored the trees and hills, revolved with the wheels. Nothing could be more appalling than the meeting of two of these rapidities, passing side by side, the speed of each doubling that of the other. Nothing is distinguishable on either train when two meet thus. Cars, men, women, are not seen to pass—nothing but light or dark forms in a whirlwind; and from this whirlwind there come cries, laughs, yells. On each track there were 60 vehicles and more than 1,000 persons—these borne to the north, the others to the south, as on a tempest.

"It takes a good deal of effort to realize that the iron horse is not a veritable beast. You can hear him snorting while he stands still, lamenting as he starts, and yelping en reute; he sweats, trembles, whistles, whinnies; now he hangs back, now he tries to run away. Long streaks of sparks fly from beneath his wheels, or his feet, as you choose, and his breath flies above your head in beautiful clouds of white vapor, to be shredded against the trees farther on. One sees that nothing but such a prodigious beast could draw thus 1,000 or 1,500 travelers—the whole population of a town, and do it at the rate of 12 leagues an hour. After our return, when, after nightfall, our engine passed near me on the way to its stable, the illusion was complete. One could hear it whining and complaining, in its whirlwind of flame and smoke, like a chafed and winded horse.

"It is true that the iron horse musn't be seen; when you see it, all the poetry disappears. To the hearing, it is a monster; to the sight, it is nothing but a machine. This is the sad infirmity of our time—always bald utility, never beauty.

"If, 400 years ago, those who invented gunpowder had invented steam (and they were perfectly capable of it) the iron horse would have been otherwise fashioned and otherwise caparisoned; he would have been living like a horse, and splendid as a statue. What a magnificent Chimera our forefathers would have made of what we call the 'boiler!' Can you imagine it? Of that boiler they would have made a scaled and monstrous belly, an enormous carapace: of the smokestack, a smoking horn or a long neck bearing a mouth full of embers; and they would have hidden the wheels under immense fins, or great drooping wings. The cars, too, would have had a hundred fantastic forms; at night, people would have seen passing through the towns now a colossal gargoyle with spread pinions, now a dragon vomiting fire, now an elephant trunk in air, panting and trumpeting; all affrighted, ardent, smoking, formidable, dragging after them, as if they were their prey, 100 other chained monsters, traversing the plains with swiftness and tumult. It would have been grand.

"But we! we are good little shopkeepers, stupid, and very proud of our stupidity. We comprehend neither art, nor nature, nor intelligence, nor fancy, nor beauty; and what we don't comprehend we pronounce useless, from the height of our littleness. It is well! Where our forefathers would have seen life, we see matter. In a steam engine there is magnificent inspiration for a statuary; and locomotives furnish an admirable opportunity to revive the beautiful art of repoussé metal. But what's all that to our drawers of coal? Their machine as it is is greatly beyond the reach of their heavy imaginations. But for me, if they had given me Watts quite nude, I should have preferred him dressed by Benvenuto Cellini!"

Inquiries Relative to Economical Operating.

In our issue of last September we published under the above heading a number of questions relative to matters in the mechanical department of a large road, which were calculated to call the attention of the mechanical officers to the many possible small leaks, and to suggest the necessity of providing against them. Study of the subject in its various phases suggested to the officer who compiled these questions the necessity of broadening the scope of inquiry, and the following revised list is the result, for which we are indebted to the courtesy of the author:

Are the standards adopted being followed?

Have they been found faulty in any respect? In both engines and cars can any further advance be made toward simplicity of construction and a reduction of the number of parts, or can additional working parts of the various standards of locomotives and cars be made interchangeable?

Are the steam producing and heating plants in the various shops doing good work, as far as arrangement of details and care in use are concerned?

Can they be improved readily, without going to any material expense?

Are the methods of shop and office heating the cheapest and most efficient that can be used, without material overhauling of the same, as by extending the use of exhaust steam?

Can any improvement be made in economy of shop or yard lighting?

Are the various steam engines and other steam-using apparatus doing economical and efficient work?

Is the shafting in good shape and do the tools seem properly speeded?

Are the tools arranged both as to grouping and also the individual handling of each tool to do the best work, and the use of oil both on shafting and tools well looked after?

Does the shop supervision and discipline seem good?

Is the making and repairing of small tools and other shop appliances properly checked, so that foremen will not spend too much money in this direction?

Are the proper means used without much expense for taking advantage of the various methods of saving time in force at some places by means of compressed air and other special tools?

Are they making anything at the shops that could be bought more cheaply, or vice versa?

When engines or cars are in the shops for special repairs, is work done on other parts which need not have been done until there was need of general overhauling?

Is higher mechanical finish put on any of the work than efficiency and economy demand, or is too high priced material used for any purpose? This applies also to painting engines and cars and woodwork on same.

Is all material, either new or old, around the shops proper, properly cared for or disposed of, and are the yards, floors and tools neatly kept, and are all small tools well cared for?

Are all orders affecting the working of the various branches of the mechanical department so transmitted down the official line that each subordinate foreman appreciates how they affect his work?

Is there any direction in which too much time or material seems expended in shop practice, especially as regards common labor, or damage to material in working?

Is scrap material used as far as can be economically done before calling for new? This applies to metals and lumber to be worked up, and old wood, shavings, etc., to be used as fuel.

Do the forms of shop requisitions, orders, time books, etc., used seem a complete check upon expenditures?

Is there a good system of handling material and the transmission of orders and messages from shop to shop, so as to save the time of men in going from place to place, or the extra handling of material?

Is any locomotive or car material carried at the storehouses that the mechanical department does not need, or is there any accumulation of supplies or unstandard material?

Is all second-hand material that can be used elsewhere reported on the surplus list?

Are the shop yards so policed that every foot is under the charge of some one official, and any material not belonging to the department in charge of the yard, reported to the proper parties, or otherwise disposed of?

Can shop office methods be improved upon to keep all necessary records at less cost?

Is the condition of engines kept up as regards freedom from throwing fire?

Are the methods of clinkering, coaling and sanding engines efficient and economical?

Is the engine coal supply so arranged that a uniform quality is furnished at the place in question?

Are any more engines kept in service than the traffic seems to demand?

Do the trains seem properly loaded from the motive-power standpoint, so as to get the best work out of engines?

Is there any unnecessary movement of light engines?

Are the road foremen keeping a constant watch of the working of the different men and engines, as regards proper handling of engines and the use of fuel and supplies?

The Results of Inventions.

Prof. R. H. Thurston, Director of Sibley College, Cornell University, in an article contributed by him to the *Forum* for May, entitled "Our Debt to Inventors—Shall We Discourage Them?" says:

In a single generation, it is agreed among statisticians, the inventors have promoted the efficiency of human labor, and have diverted to the use of man such enormous amounts of Nature's energies that production has been increased 50 to 75 per cent. more rapidly than population, and wealth has been correspondingly augmented. A day's labor produces two-thirds more in agricultural implements, or in carriages, and a half more in machinery, and 80 per cent. more in boots and shoes than in 1860. One dollar has been made capable of buying 50 per cent. more of cloth, a quarter more of every kind of staple food; five men do the work of eight, and both wages and the purchasing power of the dollar have increased together. Labor can to-day produce twice as much in a given time and secure more than twice as large a share of the product, as in the days of the origin of our patent law. In the time of Watt and Fulton six weeks were required to cross the Atlantic, and the inventor and the mechanic and the engineer now send the steamship across in six and will soon make the voyage in five days. They transport a ton a mile at sea with the combustion of the amount of fuel represented by a single one of the millions of letters in the modern foreign mail bags. They have reduced the cost of transporting wheat from New York to Liverpool from 12 cents a bushel to 4 cents, and of meat from absolute commercial impractability to 1 cent a pound. They have given the world nearly a half-million miles of railroads and transport 150,000,000,000 tons a mile each year.

"The telegraph and the telephone, those great 'monopolies' so much inveighed against at the moment, have not only presented the world with the grandest illustrations of the helpfulness of modern science in promoting commerce and the industries of production; they promote also, directly and indirectly, and in a thousand ways, the intelligence and culture of the race. Morse and his colleagues among inventors gave the world, as a contribution to education and a stimulus to moral growth, inestimable profit upon all its patrons have paid into the treasury of the telegraph companies—to be redistributed to the world. The telephone, however 'business-like' its management, is a gift from the inventor of vastly greater worth to the world than all the dividends ever declared by the telephone companies. Edison, and Thomson, and the General Electric and the Westinghouse companies, representing contributions to the world of invention and the mechanic arts, as a limited tribute, have given handsome profits to the world of users of their inventions and products. The steam engines of Jame Watt, of Frederick Sickles, of George Corliss, which constitute the foundation of the whole system of modern industries, and furnish, practically, the whole sum of the mechanical power which has built up existing material civilization, were given to us by the inventors in response to the inducements held out to them by the patent law—itself the most important invention of all.

"But a spirit diametrically opposed to the spirit in which the patent system was conceived and enacted, has within a few years sprung up, and its malevolent influence has been promptly seen and felt in the tone of legislation and in the decisions of the courts. The old feeling of indebtedness and of gratitude to the inventor and to the exploiter of inventions has become tempered by criticism and by a caviling spirit, which seeks to deprive these greatest of benefactors of the race of the intellectual property which they create and the material benefits which they, in comparatively slight degree, share with the world. When the United States loses its regard for the rights and privileges that were justly and fairly accorded to inventors in our earlier life as a nation, and, instead of gratitude and generous reward, gives them grudgingly less than a fair and liberal share of the profits which they so lavishly secure for the world, a long step will have been taken toward that decadence which, historians are accustomed to assure us, inevitably, sooner or later, comes to every people."

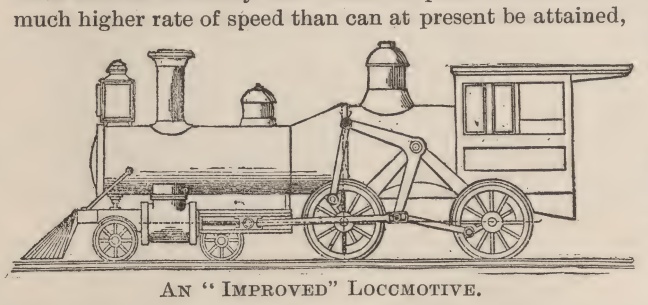
A lens 60 inches in diameter has just been cast at the Standard Plate Glass Works, in Butler, Pa. It is for the telescope of the American University at Washington.

A new power-house is being erected by the Pittsburgh Locomotive and Car Works, of Allegheny, which will cost, when completed, about $10,000. Other extensive improvements, which will tend to materially imcrease the capacity, are under way and projected.

Riverside, Cal., has beaten the world's record for the shipment of oranges in a single week. In the first week of May this southern California town sent out 224 carloads, 63,973 boxes of oranges. This surpasses the shipments from any part of the world for seven days.

A Remarkable Invention.

The illustrated arrangement to dispense with the present use of side, or connecting, rods for locomotives is heralded by the daily press as "a remarkable invention," and that it is such is very evident. It was patented recently by a man in Texas, and we are told that "the possessor of the mind in which originated this new idea is a man of more than ordinary intelligence." The arrangement intends to provide against the great trouble now experienced with locomotives getting on a dead center (according to the inventor), and, further, "the tendency of the wheels to rise from the track will be avoided, and the present difficulty, due to the balance weights, will be diminished. This feature of the invention, operating in connection with the one just described, will, by the gaining in tractive power and in the distribution of the driving power, keep an engine on the track without difficulty and make it possible to run at a much higher rate of speed than can at present be attained,



AN "IMPROVED" LOCCMOTIVE.

and also pull a heavier load with the same amount of steam."

It may be said that the last named object, to run faster and pull harder, "with the same amount of steam," is one that most railroad mechanical officers will gladly welcome a practicable means of accomplishing; but most of these rather conservative gentlemen will feel rather skeptical of a plan of doing this that involves such awkward and expensive complications as are contained in this proposed "improvement." The fact of its having six extra high duty bearings to maintain is quite sufficient to "lay it on the table" in almost any railroad mechanical office.

Demoralized the System.

"What time will that train be in, do you think?" asked the impatient man. "It is purty hard to tell," answered the agent of the little Southern line. "Sence Bill's tree was cut down by a pack of durn fool niggers after a coon, he finds it a heap of trouble makin' jest the right time." "Bill's tree?" "Yas. Bill, he is the conductor, you know. The tree I was speakin' of stood alongside the track about 30 mile up the road from here, an' when the train came along and the shadder of the tree laid acrost the middle of the top rail of Buck Johnson's fence, Bill knowed he was on time and could gage her about right to get here on schedule time. Now them fool niggers has cut it down, and all Bill has to go by is his own guess. Company was talkin' some of puttin' up a pole in the place whar the tree useter be, but they hain,t done it yit."

Excuse Enough.

A teacher in a city school received the following note from the mother of a boy who had been absent for a day or two:

"DERE MAM: Plese eggscuse Willy. He didn't hav but one pare of pants, an I kep him home to wash and mend them, an Mrs. O'toole's goat come an et them up off the line and that awt to be eggscuse enuff, goodness nose. Yours with respeck. MRS. B——."

How much did yer work that gent for, Ragsy? I wish yer wouldn't use the word "work" to me. It's unperfeshnal.

Trolley Car Conductor—Settle now, or get off. Dignified Citizen—What do you take me for, sir? Conductor—Fi cents, same as anybody else.

"You are nothing but a bag of wind," sneered the circus tent. The balloon, in its indignation, swelled visibly.

"At least," it retorted, "I am self-supporting."

What kind of garb did the man wear who called when I was out? Sam—Dunno, boss; I nebber wuz no good anyhow ter remember what kind of garbage people has on 'em.

Uneasy Walker is de luckiest feller on de road. How's dat? He's a somnambulist, and does all his walkin' in his sleep. Dat gives him all day to loaf in—*Harper's Bazar*.

Dandy youth—What the mischief did you hire me a blind horse for? Liveryman (guilelessly)—Didn't you tell me you wanted something out of sight because you were going to take your best girl driving?

"From this time on," announced Mr. Everett Wrest, "I am an Argonite." "What in thunder is an Argonite?" asked Mr. Dismal Dawson. "Argonite," explained Everett, with a pitying smile, "is derived from argon, which this paper I am now perusing says is a new element in the air which its name means 'no work.'"

A rustic who recently enjoyed his first "steam car" ride invested 80 cents for a ticket allowing a short ride and return. He boarded the train and took a seat next to the window. The train started, and gradually increased in speed. The passenger jumped up and down with ejeculations of pleasure so great that he finally commenced to swear. A minister of the gospel who sat in front of him turned round and said: "Say, young man, do you know you are going to Hades?" The young man turned his attention to the divine and said: "I don't give a cuss; I've got a return ticket.

Annual Meeting of the Joseph Dixon Crucible Company.

The annual meeting of the stockholders of the Joseph Dixon Crucible Company, Jersey City, N. J., was held recently at the company's general offices at Jersey City. The detailed statement of the business of the company for the past year met the hearty approval of stockholders, which manifested itself by the unanimous re-election of the board of directors and officers. After the stockholders' meeting had adjourned, the newly-elected directors organized and unanimously re-elected Messrs. E. F. C. Young, President; John A. Walker, Vice-President and Treasurer, and George E. Long, Secretary.

The Joseph Dixon Crucible Company, established in 1827, is the most extensive manufacturer of graphite products in the world. These comprise plumbago crucibles, graphite facings, retorts and other goods used in foundries and smelting works; lubricating graphite, graphite greases, graphite paints and Dixon's celebrated American graphite pencils, and carburet of iron stove polish. These goods find their way and meet ready sale in all the cities and towns of the civilized world.

A blacksmith was once summoned to a county court as a witness in a dispute between two of his workmen. The Judge, after hearing the testimony, asked him why he did not advise them to settle, as the costs had already amounted to three times the disputed sum. He replied: "I told the fools to settle, for, I said, the clerk would take their coats, the lawyers their shirts, and if they got into Your Honor's court, you'd skin 'em!"

The largest piece of gold ever found in the world was the "King of the Water Moon" nugget, discovered in Australia in 1852. It weighed 223 pounds and 4 ounces, and was worth $55,000. The largest nugget found in California was that known as the "Oliver Martin." It weighed 151 pounds and 6 ounces, and contained $36,270 of bullion. The second largest single find was that of the "Monumental" nugget, which weighed 1,563 ounces troy, and realized $17,655.

"Once, at least, ridicule was of great benefit to the human race." "When was that?" "When Edison made light of electricity."

"Mike," said Plodding Pete, who had been reading from a stray scrap of paper, "what does 'dernier ressort' mean?" Meandering Mike looked at him with the supercilious contempt of superior knowledge and replied, "Work."

An Irish street car conducter called out shrilly to the passengers standing in the aisle. "Will thim in front plaze to move up, so thot thim behind can take the places of thim in front, an' lave room for thim who are nather in front nor behind?"

Mr. E. T. Silvius has purchased a half interest in the Thurman Fuel Oil Burner Co., of Indianapolis, Ind., and will have charge of the railroad department. Mr. Silvius was for 10 years master mechanic of the Jacksonville, St. Augustine & Indian River Railroad.

"Waal," said the old lady, "If the airth is reound and goes reound, what holds it up?" "Oh, these learned men say it goes round the sun, and that the sun holds it up by virtue of attraction," he replied. The old lady lowered her specs and, by way of climax, responded: "Waal, if these high larnt men sez the sun holds up the airth, I should like to know what holds up the airth when the sun goes down! That s what's the matter."—*Amusing Journal.*

The Sellers Manufacturing Co., of Chicago, has been incorporated in Illinois, with a capital stock of $50,000. The company will manufacture, purchase and sell railway appliances and supples, among which is the splice bar, formerly handled by Morris Sellers & Co. The stockholders of the company are Morris Sellers, William J. Watson, T. A. Griffin, A. H, Sellers and William S. Brown. Morris Sellers is President and P. J. Geraghty is Secretary.

The speakers were two brawny Scots who evidently had not met for a long while. Sandy asked Tonald about business, but the reply was either evasive or unsatisfactory, for the rough, uncouth Sandy, perhaps suspicious that his friend had fallen into his old tricks, suddenly broke forth loudly and vehemently: "Hech, mon," he said, "but ye'll ha'e tae settle doon, mon, Tonald. Ye ken 'a rollin' stane gethers nae moss.'" "Wha's wantin' moss, ye auld foggie," was the quick retort. "An' there's wan thing a rollin' stane gethers that ye'll ne'er git—an' that's polish, ye puir gowk."

Some one with nothing else to do has investigated the way in which 100 men in fiction are represented as proposing. Seventy-two hold the lady's hand, 17 hold it very tightly, 14 have lumps in their throat and 9 exclaim aloud: "Thank heavens!" Only 7 out of 100 declare themselves to be deliriously happy, and 5 are too full for utterance. Three out of 100 stand on their feet when they make a proposal, and 2 go down on one knee, while 9 make a formal prelude—something like the slow music in the play, when the villain appeals to heaven to witness the consuming flame of his affections for the heart he plots to ruin, etc. The behavior of the lady under the circumstances is equally entertaining and instructive. Out of 100 cases 81 sink into the arms of the gentleman, 68 rest their heads on the gentleman's breast, and only one sinks into the arms of a chair; 11 clasp their arms around the gentleman's neck, 6 weep tears of joy silently and 44 weep tears aloud—whatever that means; 72 have eyes full of love and 9 out of 100 rush from the room and tell everybody. Only 4 are greatly surprised and 87 ou 100 knew that something was coming. Five giggle hysteri cally and 1 even sneezes. Only 1 of 100 struggles not to be kissed, while 6 kiss gentlemen first.—*New York Tribune.*

American vs. European Mechanics.

Perhaps few men have had more experience with mechanics of different nations than Mr. Hiram Maxim, the inventor of the famous Maxim guns, that are used by nearly all the governments of civilized countries. This gentleman recently expressed his opinion in an English newspaper regarding the relative merits of American and European machinery, and the relative proficiency of American mechanics compared with those of other countries. We abstract the following from his remarks:

"When the German Government decided to make rifles on the American interchangeable plan they purchased from the Pratt & Whitney Company, Hartford, Conn., about $1,500,000 worth of American tools. These were brought to Germany, and a manufacturer in Berlin, seeing the great advantage of the American tools, established a factory and commenced to build them on a large scale. To-day this manufacturer has not only practically driven English tools from the market on the Continent, but he is also sending tools to England and selling them at prices considerably below English tools.

"In regard to the supposed superiority of English-made tools, I would say that when I first came to England, wishing to buy lathes, I examined a large number by different English manufacturers, and I was surprised to find how old-fashioned they were. Upon asking why they did not make better lathes, they considered it a good answer to say: 'Oh, everybody knows that everything of English make is very much better than anything made abroad.' Hardly a manufacturer knew of the existence of the new American tools. So when I had to equip some very large factories, I found it much to the advantage of my company to purchase the greater part of the tools from American makers.

"Americans also excel in the manufacture of revolvers and sporting rifles, while for woodworking tools and machinery they are far ahead of all other nations. They are also ahead in automatic machinery for working metals, and also in boot and shoe machinery, etc. There are, perhaps, about as many great inventions made in the United States as in all the rest of the world. The English may be considered the most skillful manufacturers of high-class woolen goods. They are quite equal to any in the manufacture of velvets and plushes. The hand-made double-barreled guns used for sporting purposes have reached a higher degree of excellence in England than in any other country. The English also have a leading position as builders of ships and marine engines. Microscopic and photographic apparatus is also very well done in England.

"Germans are very good mechanics; they are quick to appreciate the advantages of a new system and to adopt it. German tool makers have profited very largely by the introduction of American tools. Only a very few such tools, as, for instance, milling machines, etc., are imitated in England, but the Germans imitate every mortal thing of any value made in the States, and their work is only slightly inferior to that of Americans. I have purchased and compared genuine American tools with German imitations, and have found that the castings of the former are sounder and stronger, and that the deviation from truth, though very small in the German tools, is three or four times as great as in well-made American machines.

"I was very much amused to find such a large number of very small gun shops, little shops about 8 by 10 feet; employing about two men, and everybody was working on Remington rifles. They sold a complete rifle for about $2, with 100 rounds of ammunition. I asked how this was done, and found that the barrels of the guns were rejects from Belgium, that all the mechanism of the gun was made of malleable iron and case-hardened. Upon examining one of these guns, I found marked on the barrel 'Manufactured by the Remington Arms Co., Ilion, New York, Patented so and so.' I asked them why they stamped this on the barrel, and they informed me that the guns they made were sent to Africa, and nobody in Africa would buy a rifle that was not made in the States. Each factory had a genuine Remington rifle as a model, and these were used as jigs and gages for the imitation guns which they were making."

"Frenchmen are all-around good mechanics. The imitation of American tools made in France is nearly as accurate as the genuine articles themselves, while their instruments of precision are quite as accurate as those made in the States, but they are not made in quantities as is done there, and so the price of the French instruments is four or five times as great as the American.

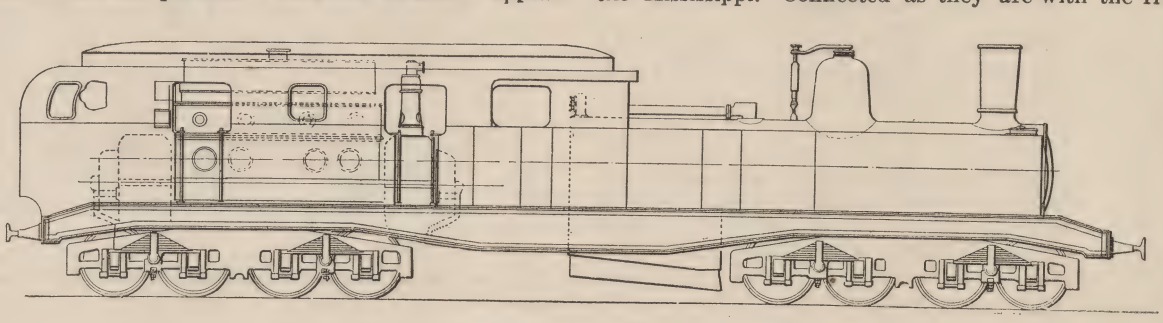
From our own experience with mechanics of different nationalities, and observation of machines of domestic and foreign make, we believe Mr. Maxim's estimates are about correct. Speaking of the German imitations of American fire arms, reminds the writer of an experience he had in Uruguay some time ago. Some of these were purchased on the supposition and assurance that they were the genuine American articles, as every outward appearance indicated, even the date of patents, etc. Use, however, quickly proved them utterly worthless and the most flagrant counterfeits. An inspection of their interior mechanism revealed exceeding grossness of material and carelessness in workmanship and adjustment.

It is announced that the Watts furnaces at Middlesboro, Ky., will go into blast about the middle of July. The Watts syndicate, which is an English concern, invested about $2,500,000 in extensive furnaces and steel plant at Middlesboro, which was completed about the time of the Baring failure, 1890. The depression in iron and the financial troubles in England delayed the final starting up of this plant, and it has remained idle. It includes two large furnaces with a capacity of about 400 tons of pig iron a day, and a steel plant with a capacity of 700 tons.

The Heilmann Electric Locomotive.

The accompanying cut shows the general construction of one of two 1,500 horse power electric locomotives now nearing completion in France, and intended to go into service on the Western Railway of France. Last year a smaller locomotive of the same type was experimented with on the same road, with the result that these two larger ones are being built. The first locomotive had its boiler for generating steam and its engine for generating electricity, dynamo and motors all connected in one somewhat ponderous arrangement. It ran first between Havre and Benzeville, and later between Paris and Mantes, attaining a speed of 50 miles an hour. The new locomotives, although somewhat similar in appearance to the first one, differ from it in many important particulars. Especial attention has been given to the improvement of details and to the elimination of faults which the first locomotive developed.

The boiler and firebox are placed in the rear of this locomotive, and the peculiar "back end forward" appearance of the original Heilmann locomotive is repeated. On each side of the boiler are two tanks capable of containing 2,500 gallons of water and six tons of coal.



Enlarged Heilmann Electric Locomotive.

The same system is followed as in the original locomotive. The steam is brought to a vertical engine, to which two dynamos are directly connected, and these latter are excited by a small generator, which also furnishes the current for the illumination of the train. The powerful motors are of the gearless type, and will be a considerable improvement upon those first experimented with. The switchboard stands in front of the driver, who has under his hand the different controlling and braking levers and handles. The whole of this compact railway central station will be housed in on all sides and the front will be sloped off to each side to give a cutting force against the air and thus diminish resistance. The locomotive is mounted upon two eight-wheel trucks. Upon each of the four axles one of the motors has been suspended.

Trial runs of the new locomotives have shown them to be capable of easily starting trains, and of running with very little rolling motion. The general criticism of the arrangement is that it is too complicated and cumbersome to prove economical in repairs and fuel. However, this remains to be proved.

The Ships at the Bottom of the Sea.

In looking at the ocean the mind almost instinctively turns to the fate of the ships which have found their resting-place therein. Fancy has depicted these vessels as thickly strewn over the bottom of the ocean, and at times as suspended in the depths, unable, on account of the density of the water, to find their way down. But all knowledge of the conditions of the deep leads us to believe that the vessel sinks to the bottom straight away. In a few hours, at most, it reaches its everlasting grave, and is ready for the swift destruction which awaits it. When it reaches the bed of the sea it must in part sink into the ooze, which everywhere is deep. Quickly the creatures of the sea, who, by long existence in fields where food is scant, have learned to avail themselves of every chance of subsistence, seize upon all the organic matter which fortune has sent to them. Even the masts and the other woodwork will shortly be honeycombed and weighted down by incrusting forms.

Ships of European peoples have been for centuries finding their way to the floor of the ocean. Probably over 100,000 vessels have met this fate since the time when our race first began to spread throughout the world. Yet by far the greatest part of these have fallen upon the shallow near the shore, where the swift currents and rapidly moving debris are likely to aid in their destruction and burial. How swiftly they disappear in these conditions may be judged by the experience of the diver who has sought for sunken treasures. Almost invariably, after 100 years or so have passed, they find that the craft is quite lost to sight. Far more money has been spent in such explorations than has been won from them.

Curiously enough, the most permanent records of man's empire of the seas are written in the ashes and clinkers from the coal-fed fires of the steamships. This waste is in its nature indestructible, and the mass of material contributed in any one year to the ocean bed is to be reckoned by the million tons. In time all the great ship routes will be paved with this debris, which will be built into the rocks.

Maine's Fifteen Hundred Lakes.

The importance of the lake system of Maine is appreciated by no one who has not studied it. There are only three or four districts of the same size upon the globe that can at all compare with Maine in the extent of its lake surface. The Kennebec River has more lakes connected with it than the gigantic Oronoco, and the Penobscot than the Amazon. Without counting the smallest variety, there are in Maine between 1,500 and 1,600 lakes, having a total area of between 2,000 and 3,000 square miles. These lakes, in the majority of cases, are at such high elevations that their positions make them storehouses of potential energy, which needs but to be properly tapped to set the wheels of industry in motion even hundreds of miles away. Eight of the large lakes have their surface over 1,000 feet above the level of the sea, while the waters of Rangeley are over 1,500 feet above the ocean, or but a few feet below the level of Lake Itasca, the source of the Mississippi. Connected as they are with the rivers, they act, moreover, as reservoirs for the gathering of the drainage, which can be sent down through the rivers in much more uniform quantities than would be possible were they not present to serve as checks.

The Height of Clouds.

The very highest clouds, those called cirrus and cirro-stratus, rise to the average height of about 30,000 feet. A second class keep at a height of from 10,000 to 23,000 feet above the earth, while the lower clouds usually float at a height seldom exceeding 5,000 feet. In the case of the last mentioned class of clouds the lower surface may be at a height not exceeding 3,000 to 4,000 feet, while their towering summit will be removed from the earth by not less than 16,000 feet. Professor Moller says that the vertical dimensions of a cloud will often exceed 10,000 feet, and that he has observed those which he had every reason to believe were not less than 25,000 feet thick.

Rust in the Interior of Boilers.

Iron is said to be incapable of decomposing water at ordinary temperatures except in the presence of air or by galvanic action, when some electro-negative substance is connected with it. For this reason we should expect little corrosion from rust in the interior of a boiler, as air is only periodically admitted when the boiler is cooled down. There is, however, the dissolved air of the feed, and this is reduced in amount when the feed water is previously heated. Under any circumstance the rust found in the interior of a boiler is of a different character from ordinary iron rust. It is, in the first place, of a much darker color. That formed in the upper spaces by steam alone is almost black, partaking of the nature of that black magnetic oxide which is formed in the Baff process by steam superheated to 950 degrees Fahrenheit. The latter oxide is, of course, completely protective when once formed, and the oxides formed in the interior of a boiler, although not of a protective nature, are, nevertheless, far less corrosive in their action than those formed under ordinary circumstances.—*Engineering Mechanics.*

Improved Refrigerator Car.

In a system of cooling freight cars lately designed, the apparatus is arranged in the ends of the car and the various parts are portable and pull out with handles like a series of desk drawers. In the hollow space within there are gridiron slides supporting the ice, and the warm air of the car enters openings at the top and filters down through the various passages to the bottom, where it is forced outward briskly by gravity. Beneath the ice is a set of metallic "baffling plates," so arranged as to catch the drip-water and retard its progress downward. The fluid falls on one, runs through holes therein or off the upper surface and then drops to the next one. Thus an extensive wetted surface is exposed to the air during its movement, with the double object of enhancing the cooling effect and making the water absorb any foul gases that may be present. All the gridirons, trays and other attachments may be removed easily for cleaning at the end of a trip, but while the car is in service they are locked in place, so as not to be disturbed by the motion of the car. The fixed portion of the apparatus is removed in sections for cleaning and repair. The inventor claims that his plan requires less ice and leaves a foot more space for freight in the length of the car than other systems now in use do.

The Western Railway Club.

The Western Railway Club held its regnlar meeting May 21, in the banquet hall of the Auditorium Hotel, Chicago. There was a topical discussion on "Car Heating." The new constitution, proposed at the April meeting, was adopted, and the annual election of officers was held.

The election of officers resulted as follows: President, Mr. G. L. Potter, Superintendent Motive Power, P. R. R.; First Vice-president, Mr. D. L. Barnes; Second Vice-president, Mr. A. M. Waitt, General Master Car Builder, L. S. & M. S. R. R.; Treasurer, Mr. J. N. Barr, Superintendent Motive Power C. M. & St. P. Ry. Mr. P. H. Peck, Master Mechanic, C. & W. I. & Belt Ry., was elected member of the Executive Committee. At a meeting of the Executive Committee immediately following the regular meeting, Mr. Walter D. Crosman was unanimously re-elected Secretary of the club.

The Southern and Southwestern Railway Club.

The announcement is made that the next meeting of this club will take place at the Kimball House, Atlanta, Ga., on Thursday, Aug. 15, 1895, at 10 o'clock a. m. The subjects for discussion will be:

Additional report of committee on draft sheets, and discussion of the subject.

Best sizes of pipes and connections for radiating results of the Baker heater; best liquid to be used. Messrs. J. M. Holt and T. S. Floyd.

Boiler washing and filling with hot water; how best accomplished. Messrs. John Dempsey, G. D. Harris and J. T. Robinson.

Present state of the art of kindling locomotive fires with oils. Messrs. W. H. Hudson, W. L. Tracy and P. H. Schreiber.

Is there any way of handling cinders and clinkers cheaply by power, or automatically, from ash pits into gondolas or on flats?

The best and most accessible plan for applying air-brakes to Hopper gondola cars having straight chutes.

A durable and cheap roundhouse floor.

Locomotive boiler lagging; most recent practice for high pressure boilers; efficiency as non-conductors, cost, durability, ease of application, ease of removal, and replacement for repairs, fire-proof qualities and influence on external corrosion.

The last four subjects have no special committees and are open to all.

The Needs of Axle Inspection.

The English Board of Trade recently investigated and reported on an accident on the Great Northern Railway, resulting from a broken axle under a locomotive. The break was in the wheel seat, and there was a previous fracture at this place extending over about a fourth of the sectional area of the axle. The axle was steel, 25½ years old and had run 578,020 miles. It had been used under several engines. The report concludes as follows:

"Doubtless the mileage run by the broken axle is high, but no limit of age either in years or miles has ever been laid down for locomotive axles, though it is usual to subject all engines to a special examination when they have run 250,000 miles, and after every subsequent 100,000 miles. It must be admitted that it is somewhat disappointing to find that science has hitherto failed to discover some practical means of testing masses of metal, such as railway axles, for flaws that are concealed from view. What seems to be required is some test, possibly by means of electricity, magnetism, or sound, which could be readily applied at suitable intervals to each individual axle, and by which it can be ascertained whether the axle is structurally perfect throughbut. Whether such a test is possible I cannot say, but the subject seems to be one which is worthy of consideration, and of more scientific investigation (as distinguished from the rougher methods of the workshop) than, so far as I can ascertain, it has hitherto received. It has sometimes been suggested that it is desirable to fix a limit of age, either in years or miles, for all locomotive axles, after reaching which, whether they are apparently sound or not, they should be withdrawn from use. But the locomotive superintendents of railway companies have not as yet seen their way to act upon this suggestion."

Universal Competition.

The steam railways are suffering from the competition of the trolley roads, and now the cry is raised that the trolleys are being painfully depleted of their traffic by the bicycles; which suggests the great law of nature pointed out by a poetic observer:

> The larger fleas have smaller fleas to worry and to bite 'em;
> And these in turn have smaller fleas, and so, *ad infinitum*.

The irresponsible and unregulated bicycle, by the way, has long been a growing competitor of the livery stable, and when, in addition to this, carriages propelled by electricity or steam begin to be a frequent sight on the streets the faithful horse may well tremble for his existence. The railways have greatly simplified, but have not ended, the problem of transportation, and they are likely to have to contend with still sharper competition than now, as a result of the continued development of human ingenuity.—The *Railway Age*.

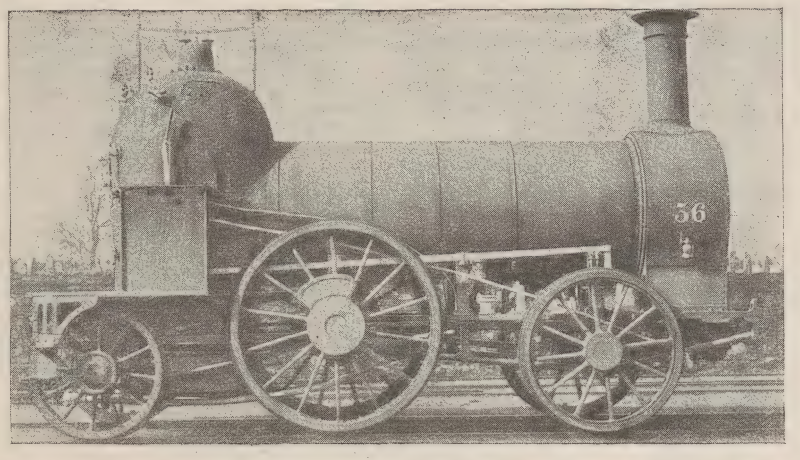
Traveler (20 years hence)—"Trilby? Trilby? That is a queer name for a town. I wonder whence it was derived?"

Citizen of Trilby Station—"Dunno. I guess it's Injun."

Great Southern & Western Locomotives.

The photographs reproduced in the two following engravings show the former and present types of locomotives used on the Great Southern & Western Railway, of Ireland.

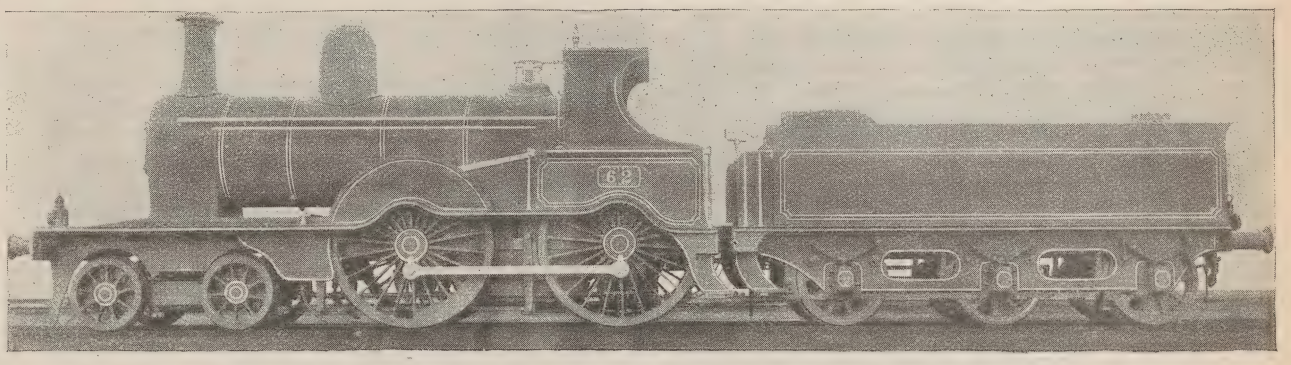
The illustration of engine No. 36 shows a type of locomotive now obsolete in Ireland. It was built in 1848, and, now that its days of usefulness are past, it is preserved as a relic in the Inchicore shops of the company, near Dublin. It has bar frames, single driving wheels 6 feet in diameter, and cylinders 15 by 20 inches.



Old Irish Locomotive.

Our next engraving shows an engine recently built at the works named above. It is the type of express engine employed for working the American Mail and other fast trains between Dublin and Queenstown. The leading dimensions are as follows: Cylinders, 18 by 24 inches; coupled wheels, 6 feet 6 inches; diameter bogie wheels, 3 feet; boiler, 4 feet 4 inches diameter, 9 feet 9¼ inches long, containing 204 brass tubes, 1¾ inches outside diameter.

The total heating surface is about 1,050 square feet, and the grate area 18.84 square feet. The weight of engine in working order is 44 tons; the steam pressure carried is 150 pounds per square inch. The tender holds 2,700 gallons of water and about five tons of coal.



Fast Passenger Locomotive, Great Southern & Western Railway, of Ireland.

Some Speed Statistics.

The fast run on the Camden & Atlantic Division of the Pennsylvania Railroad, on April 21, mentioned in our last issue, has been much commented on, as it broke all existing records of railroad speed in this country, and, in fact, in the world, but it was made under the most favorable conditions. There is not a piece of railroad more perfect, physically. It was not that any one of the 58 miles was covered at a record-breaking pace, for the fastest mile, near Hammonton, was covered in 41 seconds, while No. 999, on the New York Central, has done 9 seconds better, but never before has a speed so sustained been reached by any railroad train of which there is record. The 58 miles between the Camden station and the Atlantic City board-walk was rolled off in 45¾ minutes, an average speed of nearly 77 miles an hour. The stretch of road, 25 miles long, between Winslow Junction and Absecom, was covered at the rate of 83 miles an hour. The best runs for a similar distance previously made were by the Empire State express, on the New York Central road. In March, 1892, this train covered the 21 miles between Oneida and De Witt at the rate of 72.69 miles an hour. In November of that year it ran 52 miles, between Syracuse and Utica, at a rate of 67.38 miles, and in May, 1893, it did the 80 miles between Rochester and Syracuse at the rate of 68.45 miles an hour. On English railways the Great Western holds the record, the 53 miles between London and Didcot having been covered in 47 minutes.

"What time does the last train leave?" asked the traveler. The gatekeeper at the Boston depot gave him a haughty look and replied, "When the road quits business."

During a heavy gale on May 2, as a way freight on the Chicago, St. Paul, Minneapolis & Omaha Railroad was approaching Eau Claire, Wis, 11 loaded cars and the tender were blown from the track and toppled over. All of the train that was left on the track was the locomotive and the caboose.

The Most Important Official.

In reply to the question, "Who do you think is the most important official connected with railroad operating?" Mr. C. W. Bradley, General Superintendent of the West Shore road, recently said: "The Car Inspector. That man has the whole of us by the heels. We smaller people put in hard work securing business for the company. Some of us labor to get freight rushed through to its destination, and we try to keep things moving. We sit up nights figuring on how we can save an hour for a car between New York and Buffalo. All at once the Car Inspector holds up his paralyzing chalk and everything stops.

"The Car Inspector has had his turn. I think it is time that superintendents and managers and presidents should have something to say about how the business shall be handled."

The "London Limited" express train, which the Pennsylvania ran from Philadelphia to Jersey City last summer to connect with steamers sailing for Europe, will be run again this summer. The train starts from Philadelphia at 8 a. m., and a connecting boat takes passengers directly to the pier of the American line.

A Northern Central freight train consisting of 75 air-braked cars loaded with wheat was successfully handled April 29, between Sunbury and Rockville, Pa., a distance of 48 miles.

Business has improved to such an extent on the Erie lines that the receivers have felt justified in issuing an order for the resumption of work at the shops in Hornellsville, and some other points on full time. This order affects about 700 men who have been on reduced time for over two years.

The Great Northern has put on a new schedule for passenger trains from St. Paul, Minn., to the Pacific Coast, which reduces the time eight hours.

Traffic is so heavy with the Pittsburgh, Fort Wayne & Chicago that every one of the company's engines is in service, and some are being transferred from other divisions of the Pennsylvansa system. There has been a great improvement in freight and passenger business with that line.

The Elliott Car Company, of Gadsden, Ala., is working over 200 men at present, and within the next two weeks it will have to increase its present force by 300 men, in consequence of extensive orders ahead. The company has a contract for 500 cars, which are now in course of construction.

Perhaps the most beautiful series of pictures ever presented of the Rocky Mountains will be found in a collection of 14 original paintings, executed by Thomas Moran for the May *Cosmopolitan*. To those who have been in the Rockies, this issue of the *Cosmopolitan* will be a souvenir worthy of preservation.

A test extending over seven months at a large boiler plant in Yorkshire, England, had for its purpose the determination of the economy, if any, of using gas as fuel under the boilers, when this gas is obtained from slack. The air for the combustion of the gas was heated by circulation in pipes within a chamber kept hot by the gas-making plant and the heated air and the gas conducted to the fire-box in the proper amounts for complete combustion. A great reduction in consumption of fuel is claimed for it.

The Illinois Central will soon build new car shops at Chicago, between Ninety-fifth and Ninety-seventh streets, and costing about $500,000. They will be built of brick, and equipped with the most improved machinery. The plans, which have been prepared by Chief Engineer Wallace, are for five buildings. Four of them will be one story in height, and three of them will be 362 feet long and 160 feet wide. The fourth will be 502 feet long and 100 feet wide. The remaining building will be 254 feet by 110 feet. The large shops will be used as a planing mill, while the others will be passenger and freight car shops.

Iron and Steel Production in 1894.

The American Iron and Steel Association will soon issue its annual statistical report. The *Bulletin* prints the following data from the forthcoming volume:

The production of pig iron in the United States in 1894 was 6,657,388 gross tons, against 7,124,502 tons in 1893, a decrease of 467,114 tons. Of the total production in 1894 only 222,422 tons were made with charcoal and only 120,075 tons were made with anthracite alone. Of the total production 3,808,567 tons, or over 57 per cent. were of Bessemer quality. In 1893 the Bessemer pig iron produced was about 50 per cent. of the total production. The imports of pig iron in 1894 amounted to 15,582 gross tons, which was the smallest annual importation of which we have any record. The largest annual production of pig iron in the United States was in 1890, when it amounted to 9,202,703 gross tons. In 1892 the next largest production was attained, namely, 9,157,000 tons.

The production of Bessemer steel ingots in the United States in 1894, was 3,571,313 gross tons, against 3,215,686 tons in 1893, an increase of 355,627 tons.

The production of open hearth steel ingots and direct castings in the United States in 1894 was 784,936 gross tons, against 737,890 tons in 1893, an increase of 47,046 tons.

The production of crucible steel ingots in the United States in 1894 was 51,702 gross tons, against 63,613 tons in 1893, a decrease of 11,911 tons.

The production of all kinds of rails in the United States in 1894 was 1,021,772 gross tons, against 1,136,458 tons in 1893, a decrease of 114,686 tons. Included in the above total of rails produced in 1894 were 157,457 tons of street and electric rails, against a similar production in 1893 of 133,423 tons, showing an increase in 1894 of 24,034 tons. The production in 1894 was the smallest since 1885, a year of depression, when 976,978 gross tons were made.

The production of iron and steel structural shapes in the United States in 1894, not including plate girders, was 505,901 gross tons, against 387,307 tons in 1893, and 453,957 tons in 1892.

The production of plate and sheet iron and steel in the United States in 1894, excluding nail plate, and also excluding skelp iron and steel, amounted to 682,900 gross tons, against 674,345 tons in 1893 and 751,460 tons in 1892.

Special Freight Service for Thousand Island.

Intending exhibitors at the conventions will be interested in the following announcement made by the General Freight Agent of the Rome, Watertown & Ogdensburg Railroad:

Commencing, Wednesday, May 15, special freight service will be given from New York, Rome, Utica, Syracuse, Oswego and Watertown to Clayton, for Thousand Island points, also for Clayton proper. Freight delivered N. Y. C. & H. R. Railroad at Barclay street, New York, at or before 4 p. m. will arrive at Clayton at 7 a. m. on the second day. Freight delivered at our freight stations in Utica and Rome not later than 4:30 p. m., at Oswego, Syracuse and Watertown not later than 5 p. m., will arrive at Clayton at 7. a. m. on the following day. Freight arriving at Clayton at 7 a. m. will leave that point for all river landings of the Thousand Island Steamboat Company, including Alexandria Bay, at 10:35 a. m. same day, arriving at destination not later than 10:30 a. m. This will be a daily service, except Sunday, and every effort will be made to insure movement according to schedule.

The Torpedo Injector.

The New England Co., of 45-47 Beverly Street, Boston, manufactures an improved form of injector specially adapted for locomotive service where the water is bad, and consequently the injectors must often be taken apart to be cleaned. It is designed to facilitate necessary cleaning and repairing. This injector is known as the "Torpedo" injector, and we publish below a letter sent to the makers by Mr. L. M. Butler, Master Mechanic of the N. Y., N. H. & H. R. R., at Providence, in reference to its action on one of the engines on his division:

Some time ago you sent me your new No. 9 "Torpedo" for trial. I immediately put it on to the right-hand side of engine 354, a 17-inch by 24-inch cylinder that runs express passenger trains of five cars between Providence and Worcester. Would say it took the place of a No. 8 National. The engineer reports that he can run his train with your new torpedo better than anything he has ever used before, and that he can use it continuously under all circumstances, whether his train is light or heavy or making up lost time. At same time can easily flood his engine. I will add that its simplicity is remarkable, considering what we have always contended with. I say this from the fact that it can be easily taken apart in five minutes with a common monkey-wrench. I would especially mention the simple and ingenious way by which the feed water supply is controlled. I think anyone having occasion to examine this injector will confirm what I have said herein. In short, your torpedo is a most desirable and valuable improvement.

The Merrill Manufacturing Company, of 126 Liberty street, New York, makes a specialty of the manufacture of pneumatic pumps and air compressors. In this pumping system a small pipe conveys the compressed air any distance to a submerged pneumatic pump. It consisis of a plain, simple water chamber, with no complicated or movable mechanism about it. The compressed air comes in direct contact with the water and forces it with great certainty, any distance or height to the desired place of delivery.

The plant, good will and business of the Johnson Railroad Signal Company, was bought at receiver's sale on the 23d. inst., by the National Switch & Signal Company.

Good Work by Handcock Inspirators.

A very important aid to fuel economy in locomotive operating is a good boiler feeder, and one that can be graduated to conform to the character of work. The following testimonials which a representative of the NATIONAL CAR AND LOCOMOTIVE BUILDER saw in the offices of the Handcock Inspirator Company in Boston, recently, in reference to the service of inspirators, show that these are very serviceable and satisfactory boiler feeders. Both letters are from experienced engineers:

"I wish to say that the No. 8 Handcock Inspirator used on my engine is doing excellent service now as for the past two (2) years, making a run with 7 cars for 20 miles out and back without shutting off, the first and last 8 miles making 15 stops, and I am under these conditions saving one-half ton of coal per day."

"As to the Hancock Inspirator, would say that I have made a run of 114 miles with caboose car and not shut off inspirator when working steam, and it is large enough to supply any train the engine is able to haul. I think it is the finest working injector ever handled by me in my engineering experience of 20 years. In fact, it is an injector I use at any pressure of steam, in the round house with 40 lbs. steam, or on the road to 180 lbs., and with the confidence of starting every time as readily as my engine when I open the throttle. Never failed to prime with water at the hottest, when blowing back, the past winter."

Improved Car Seats.

The Bushnell Manufacturing Company, of Easton, Pa., has sent us a handsomely illustrated catalogue of its well and favorably known car seats and fixtures. A page is devoted to a picture of the company's new plant and office. Speaking of the new plant, the following announcement is made:

"The result has been most satisfactory, as the saving in the cost of production exceeds our most sanguine expectations, and we only ask an opportunity to demonstrate the fact that no other manufacturer can compete with us in mechanical construction, artistic designs, workmanship or prices."

The following are among the recent orders received for car seats by this company:

Orleans Street Railway, New Orleans, longitudinal spring seats and backs; Detroit & Mt. Clements Railway, reversible plush seats; Akron, Bedford & Cleveland Inter-urban, special reversible plush seats; Burlington & Mt. Holly Branch of Pennsylvania Railroad, high back plush seats; Passadena & Pacific, Los Angeles, reversible plush seats.

The Cleveland Twist Drill Company has moved from its old quarters at No. 102 Reade street to No. 99 Reade street, New York, where it will keep a large, complete and new stock of its goods for the Eastern trade.

One of the specialties of the Q. & C. Company., is a line of cold metal sawing machines, and we have received a very nicely printed and illustrated pamphlet describing a number of these time and labor-saving machines.

The Brady Metal Company, 115 Broadway, New York, reports increased demands for its well known "Magnus" metals. Several new contracts have been closed with prominent railways. "Magnus" is now in service on nine of the fastest passenger trains run in America.

The Tight Joint Company, of 159-161 Bank street, New York, makes an admirable form of joint fittings that will not leak from expansion or contraction. These fittings are adapted for all pipe joints about locomotives and cars, and their construction is such as to absolutely prevent leakage.

The N. & G. Taylor Company, tin plate manufacturers, of Philadelphia, have given up their old quarters in Water street, New York City, and have moved to the Cable Building, No. 621 Broadway, where they have opened new and commodious offices in charge of Mr. George Livingston, a gentleman who has long been identified with the building and kindred trades of New York and Brooklyn. The company has also secured larger and better warehouse facilities for the quick filling of orders.

The American Wearing Varnishing Company, of 111 Broadway, New York, makes a specialty of the manufacture of high-grade coach and railway varnishes. These consist of several brands, the "Non-spotting" brand being the result of 36 years' practical experience in the manufacture of coach varnishes. It hardens from the inside out, and will not bloom. The car-finishing brands are specially adapted to resist the action of cinders and smoke, and the effects of climatic changes.

The Q & C. Company has sent us an album of phto-engravings of cross ties showing the beneficial results of using the "Servis" tie plates for their protection from the cutting, rasping action of rail flanges. It is well recognized that the proper protection of ties results in large economies from saving in material and labor. An authority speaking of the value of the treatment of cross ties, recently said:

"Against the abrading action of the rail moving under the traffic, we may interpose the protection of the tie plate, the flanges of which imbedding themselves in the wood in the direction of its fibers, become an integral part of it, and will enable us to substitute for white oak, less expensive woods."

The Sterlingworth Railway Supply Company has been vigorously pushing the sale of its specialties, and as a result it has placed its brakebeams and steel body bolsters on the following roads: Toledo, St. Louis & Terre Haute; Burlington, Cedar Rapids & Northern; Delaware, Lackawanna & Western; Central Railroad of Georgia; Maine Central; New York, Ontario & Western; Mather Stock Car Company; Cold Blast Transportation Company; Fitchburg; Fall Brook; Georgia Southern & Florida; Atlanta & West Point, etc. Their orders aggregate many thousands of beams and bolsters.

The Ball Nozzle.

One of the most interesting things to a visitor in New York is the exhibit of the Automatic Ball Nozzle Company in the new building corner Thirteenth street and Broadway. As a fire appliance it has been demonstrated to be thirty times as effective as the ordinary straight stream; for this reason its value for fire protection of car shops, trainyards and sheds cannot be over estimated. The insurance companies appreciate its great value and are giving large reductions in rates wherever it is installed. This is not, however, its only field of usefulness as it is a perfect spray nozzle for spraying compressed air for cleaning seats of cars. Now that this method of cleaning car seats has been demonstrated to be far superior to the hand method a great field is open for the ball nozzle here. It promises to very much diminish the cost of cleaning car windows and the outsides of cars, as with this powerful spray a few minutes will suffice to clean a car.

The world is indebted to a Philadelphia "cabby" for the following bit of philosophy: "De Devil ain't as black as he's painted, an' a woman ain't always as blonde as she's bleached."

The employés of the Cohansey Glass Works struck recently because the manager would not supply them with ice water. The issue has the merit of being definite, at any rate, and one over which both parties should keep cool.

An Albany young man, who recently took unto himself a wife, and who is acquainted with Chauncey M. Depew, wrote to that gentleman asking for a pass for his mother-in-law to come and pay him a visit. "Don't forget to have the return coupon attached," said he, in closing. Next day he received an answer from Mr. Depew, inclosing the pass. "You will note," said the genial president of the Central, "that I have not neglected the return coupon, and that, moreover, I have limited it to three days."—*Albany Journal.*

Concerning large driving wheels Mr. Clement E. Stretton has addessed a note to *Engineering* in which he says: "It is a well-known fact that a celebrated engine named the 'Hurricane' was constructed in 1838 for the Great Western Railway; it had the largest driving wheels ever made, namely, 10 feet in diameter, and the only one of that size Mr. G. A. Sekon, in his new book on 'The Great Western Railway,' maintains that another engine named the 'Ajax' had also '10-foot wheels.' As an important link in locomotive history, it should be recorded that the working drawings of the 'Ajax' were at the Chicago Exhibition, and the driving wheels were 8 feet in diameter, and not 10 feet."

The Chicago Grain Door Company recently filled an order for grain door fittings for 500 box cars, being built for the Great Northern.

Messrs. Mundt & Sons, makers of perforated metals, of 88-90 Walker street, New York, have issued a very nicely illustrated catalogue showing the different patterns of perforated work they turn out. Some of these are very fancy, and it is announced that the makers are prepared to perforate any design wanted.

The Phosphor Bronze Smelting Company., of 2200 Washington avenue, Philadelphia, has issued a neat pamphlet descriptive of the merits of phosphor bronze alloys. Among other interesting facts, it announces that its brand "S" has the highest qualities required of a bearing metal, and its long service under some of the fastest trains and heaviest locomotives and machinery in the United States has proved its reliability. It is hard and wears well without injuring the journal; the amount of friction is reduced to a minimum, and it is not liable to cut the axle even when running hot. This alloy has also been successfully employed for cylinder rings of steam engines, the small amount of friction of its surfaces and its elasticity recommending it for this purpose. These rings can be used with or without any lining of soft metal, and are found more durable than the ordinary rings.

Our Directory.

OF OFFICIAL CHANGES IN MAY.

We note the following changes of officers since our last issue. Information relative to such changes is solicited.

Atlantic & Danville.—M. M. Reid is appointed Master Mechanic, with office at Portsmouth, Va.

Louisville, New Albany & Chicago.—Henry Watkeys is appointed Master Mechanic.

Mexican Central.—B. E. McIntyre is appointed Purchasing Agent, vice E. W. Baker, resigned.

Ohio Southern.—George W. Saul, President, is appointed Receiver.

Pensacola & Perdido.—J. S. Leonard is appointed Receiver.

Seaboard Air Line.—Charles Royal is appointed Master Mechanic at Portsmouth, Va.

Toledo, St. Louis & Kansas City.—Superintendent Motive Power Chas. E. Walker has resigned.

Trinity, Cameron & Western.—W. H. Riley is appoined Master Mechanic.

Ulster & Delaware.—General Superintendant J. H. Jones has resigned, and is succeeded by Austin E. Benson.

Western Maryland.—H. M. Burgand is appointed Purchasing Agent, with office at Baltimore.

Employment.

Foreman wanted for blacksmith shop doing car work and general forging. Must be a thoroughly practical man, able to handle men to advantage, and must be capable of designing dies and formers for drop hammers and other machines. Only first-class men need apply. Address "OPPORTUNITY," NATIONAL CAR AND LOCOMOTIVE BUILDER, Morse Building, New York City.

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NATIONAL CAR LOCOMOTIVE BUILDER

JULY, 1895.

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The North Carolina Railroad has ordered 30 cars of the Middletown Car Works.

The Choctaw, Oklahoma & Gulf Railroad is about to order 500 box and cattle cars.

The production of coal throughout the world last year was estimated at 553,700,000 tons.

The Chicago, Rock Island & Pacific has ordered 200 cars of the Michigan Peninsular Car Co.

The South Baltimore Car Works are building 200 coal cars for the West Fairmount Coal and Coke Company.

The Elliott Car Company, of Gadsen, Ala., is engaged on an order for 3,600 car wheels for the Mexican National Railroad.

A 10-stalled roundhouse is being erected at Toledo by the Wabash Railroad to replace the one burned several months ago.

The Baltimore & Ohio Railroad has contracted with the South Baltimore Car Works for repairing 1,300 freight cars.

The North Carolina Car Company of Raleigh, N. C., informs us that the car building industry is rapidly improving in that section.

The Westinghouse reinforced brake is being put on the fast trains of the Pennsylvania Railroad between New York and Washington.

The Laconia Car Company has closed a contract with the Boston & Maine Railroad for the construction of 200 box, 200 flat and 200 coal cars.

The States of New York and New Jersey have appointed a joint commission to rescue the Palisades on the Hudson from disfigurement and destruction.

The French railroads are about to adopt the American system of checking baggage. The Chemin de Fer de l'Ouest began this practice June 1.

On June 11 the New York, New Haven & Hartford Railroad Company awarded contracts for road-bed improvements aggregating nearly $2,000,000.

The roundhouse and repair shop of the Atchison, Topeka & Santa Fe., at Wichita, Kan., was burned on the night of June 9, and 12 locomotives were badly damaged.

The Toledo, St. Louis & Kansas City has issued specifications for several hundred freight cars. The number is not yet decided upon, but it will probably be between 300 and 500.

The Ashtabula wreck is recalled to mind by the erection of a monument at Ashtabula, O., May 30, as a memorial of the unidentified persons who perished in that disaster Dec. 29, 1876.

Spontaneous combustion is given as the cause of a fire that destroyed the ten-stall roundhouse of the Atchison, Topeka at Santa Fe at Arkansas City, Kans., June 10. Seven locomotives and a small shop equipment of tools were destroyed.

The Cincinnati, New Orleans & Texas Pacific has ordered 52 flat cars of the Madison Car Company, of Madison, Ill. The cars are to be 40 feet long, 8 feet 10 inches wide, and of 60,000 pounds capacity.

It is reported that the Williams Palace Car Company will soon begin the erection of extensive works at Kansas City, which, when put in operation, will furnish employment to several hundred men.

The appeal case of the Westinghouse and Boyden air brake companies was heard in the United States Circuit Court of Appeals at Richmond, Va., June 10. The decision will be announced Oct. 1 next.

The Richmond Locomotive Works have delivered to the Atlantic & North Carolina Railroad 2 wood-burning passenger engines, with cylinders 16 by 24 inches. These engines are for fast passenger service.

The Wheeling & Lake Erie shops at Toledo, O., have recently finished a combination mail and baggage car, the fixtures of the mail compartment being made according to the specifications of the Government.

In France it is proposed to furnish railway passenger with a large card designating their destination. This card the passenger may deposit on any seat in a railway car, and thus secure the seat for the trip.

The Rogers Locomotive Company has received an order for building four two-cylinder compound locomotives for the government railroads of Chili. Two of the engines are to be 8-wheelers and two 10-wheelers.

On June 18 the Southern Railway bought the Chattanooga Union and Union railways, securing valuable terminal facilities at Chattanooga. The two roads completely encircle the city, and have branches to six outlying suburbs.

A 63-hour freight run between between New York and St. Louis, the fastest of any in the country between these points by 48 hours, has been started by the Wabash Railroad, in connection with the Michigan Central and the New York Central roads.

On June 19 the Directors of the Baltimore & Ohio Railroad decided to pay the customary dividend of 3 per cent. for the six months ending June 30 on the preferred stock of the company. The statement of the receipts for May shows a net increase of $124,570.

The North American Company, for which the heavy electric locomotive illustrated on page 76 of our May issue was built, operates the property of the Oregon & Transcontinental Company and extensive street railway and electric lighting interests in Milwaukee.

The Fall Brook Railway has placed an order with the Union Car Company, of Buffalo, for 250 new double-hopper gondola cars of 60,000 pounds capacity. They will be equipped with Gould couplers, Westinghouse automatic air-brakes, the Fox trucks and all modern improvements.

A wreck was caused by a broken axle on the New York, Lake Erie & Western, June 5. A westbound freight train was passing an eastbound freight on the double track near Darien, N. Y., when an axle beneath the freight car broke and derailed the car in front of the locomotive of the westbound train, causing a bad wreck and the loss of several lives.

In a paper read to the Institution of Civil Engineers by Mr. William H. Fowler recently on boiler explosions, a case was mentioned, as an illustration of the stresses set up by unequal expansion and contraction, of a boiler in which an explosion occurred two hours after the fire was withdrawn.

Negotiations relative to the entrance of the Southern Railway to Norfolk, Va., are in progress. Norfolk has for a long time hoped that the Southern could be induced to come to Norfolk. It will open up a section rich in agricultural and manufacturing industries which Norfolk has never been able to reach.

A newspaper train, consisting of an engine and four cars, was derailed at a sharp curve in the New Haven yards of the New York, New Haven & Hartford Railroad, June 16. The engine and three cars left the track and were badly damaged, injuring seriously several trainmen and doing a considerable lot of damage.

The Central Railroad of New Jersey has made all arrangements to begin on July 1 the work of depressing the streets in Elizabeth under its main line. There are five streets to be lowered, and girder bridges will be used to run over at these points. The work is to be pushed rapidly forward, so as to be completed before winter sets in.

The Southern Railway has bought the Atlanta & Florida Railroad. The line is 104 miles long and extends from Atlanta to Fort Valley, in the heart of the peach section. The price was $275,000. The Southern bought it from the Central Trust Company of New York. This deal keeps the Seaboard Air Line out of Florida and the Plant system out of Atlanta.

The new Canadian Canal at Sault Ste. Marie was opened on June 13. The canal runs through St. Mary's Island, on the north side of the rapids of St. Mary's River, and, with the river, provides Canada with independent communication between Lakes Huron and Superior. The length of the canal and its approaches is 18,100 feet. The cost was $4,000,000.

The control of the Depew Improvement Company has passed into the hands of Messrs. Chauncey M. Depew, H. Walter Webb, Dr. W. Seward Webb, John Jacob Astor and H. McK. Twombly. It is supposed that the vast interests controlled by these gentlemen will be utilized to some extent in making a large and prosperous town of Depew, N. Y.

The captive balloon which the French expect to employ at the World's Fair in 1900 will be 144 feet in diameter, and is to ascend to an elevation of 1,950 feet. This is twice as high as the Eiffel Tower. The balloon is to be managed by a wire cable, varying in diameter from 3.93 to 4.71 inches, and will probably be capable of taking up 160 passengers at once.

Miss Fannie Nesbitt, the night operator at the Union Pacific station in Topeka, Kan., has been presented with a gold medal by her fellow-operators on the road for the heroism she displayed at Bonner Springs last fall, when a robber attempted to raid her office. Miss Nesbitt fought the robber off with a revolver, and saved express packages containing $1,200 in cash.

The Southern Pacific has ordered six sleeping cars, two dining cars, four composite cars and four compartment and parlor cars combined, with wide platforms and vestibules, of the Pullman Company. The cars are for use on the Sunset limited trains, which the company runs semi-weekly during the fall and winter between New Orleans, Los Angelos and San Francisco.

The Baldwin Locomotive Works are building 10 8-wheel passenger locomotives for the Missouri Pacific, ordered late in May. The dimensions are as follows: Cylinders, 18 inches by 24 inches; driving wheels, 66 inches in diameter; steel boilers, 60 inches in diameter, designed to carry 180 pounds pressure. It is announced that this road will shortly order 15 more locomotives.

The State authorities of Illinois received on June 8 the statement of the gross receipts of the Illinois Central Railroad for the six months ended April 30, 1895, of which the State's share, 7 per cent, amounts to $296,723.26. This is the largest sum ever received by the State from the railroad for any like period, except the $302,890.90 paid for the period from Nov. 1, 1892, to April 30, 1893.

The New York, Chicago & St. Louis, "Nickel Plate," is again part of a through line carrying solid passenger trains between Chicago and New York and Boston, having completed arrangements with the West Shore and Fitchburg roads to that end. The distance to New York is 952 miles. The new train leaves Chicago at 1:30 p. m., reaching New York at 6:30 and Boston at 9 the next evening.

The Pennsylvania Railroad now runs special trains from Philadelphia to connect at New York with outgoing steamers of the American and Red Star lines on their sailing days. The train, composed of Pullman parlor cars, baggage car and coaches, transports passengers to Jersey City, and the baggage is transferred direct to the steamship pier. No extra fare will be charged on this train.

Several uses for peat have recently been discovered in Holland. The fiber of red peat (which is usually found above the black peat) can be combed out and woven into cloth suitable for rugs. Black peat may be reduced to powder and then compressed into blocks that look like ebony. These may be shaped and carved into pistol handles and similar articles, and will prove as substantial as wood.

A Buffalo paper says that the railroads entering Buffalo, other than those controlled by the Vanderbilt interest, have about decided to erect a union station at East Buffalo and thereby escape the tribute they have paid for years to the New York Central for the use of the latter's station, and also the immense cost of elevating their tracks in accordance with the grade crossing plans, estimated at $2,500,000.

The growth of the street-car mail service in this country has been rapid. There are now more than eighty lines in successful operation. In Brooklyn and Boston there are regular mail cars, and Philadelphia and Chicago will soon follow suit. In Boston the mail cars are fitted similar to the steam railway mail car. Post Office clerks accompany each car, and the work of sorting and distributing is carried on en route.

The Kansas City & Northern Connecting Railway Company was incorporated May 24. This railroad has been organized for the purpose of securing an inlet into Kansas City for three Eastern railroads, two of which are believed to be the Baltimore & Ohio and Chicago & Northwestern. Negotiations are now pending with the Chicago, Milwaukee & St. Paul Railway for the use of its bridge. The company is capitalized for $1,000,000.

An English railroad man, writing to *Engineering* about locomotive cabs, says that in Germany a closed cab, similar to that adopted in the United States, has recently been introduced on the state railways, more especially in Prussia. These cabs are now fitted with seats for enginemen. This question of seats was the subject of a long discussion in the German technical press, which ended in the general adoption of a seat of special design.

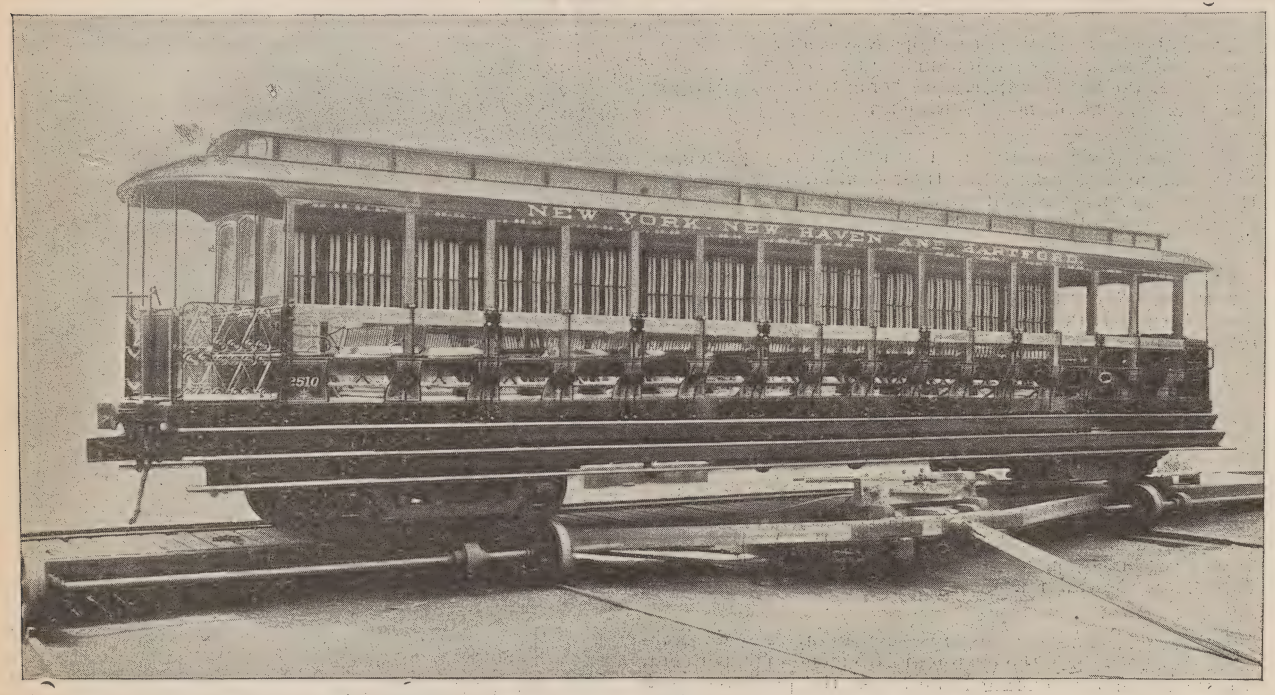
Finding travel to the Fulton Chain region increasing daily, the New York Central has arranged for a special sleeping car to leave Grand Central Station, New York, every Friday night, at 6:25, running to Fulton Chain, to accommodate the large travel to the territory tributary to the Fulton Chain of Lakes, twelve in number—Racquette Lake, Blue Mountain Lake, Long Lake, Forked Lake, etc. The car will return from Fulton Chain every Sunday night, reaching New York at 7:45 a.m.

The Erie Car Works, of Erie, Pa., have resumed operations under the ownership of Messrs. Hamilton & Knoll. The works are engaged on considerable new and repair work, and extensive improvements will be made in the near future. In addition to car work, the firm will make engine and boiler forgings. The shipping facilities are good, as the Lake Shore & Michigan Southern and Nickel Plate roads have tracks on the grounds, and the Pittsburgh & Lake Erie is building a line to reach the shops.

Some time ago the United States Government asked bids on some steel boiler plates to contain three per cent. of nickel and to meet specifications as follows: Tensile strength 80,000 pounds, elongation of at least 25 per cent. in 8 inches, and an elastic limit of at least 50,000 pounds per square inch. The Carnegie Steel Company was given the contract for 5¼ cents per pound. Plates 1⅛ inches thick were rolled, and one of the plates is said to have shown a tensile strength of 86,000 pounds to the square inch, and to slightly exceed the requirements in reduction of area and elongation.

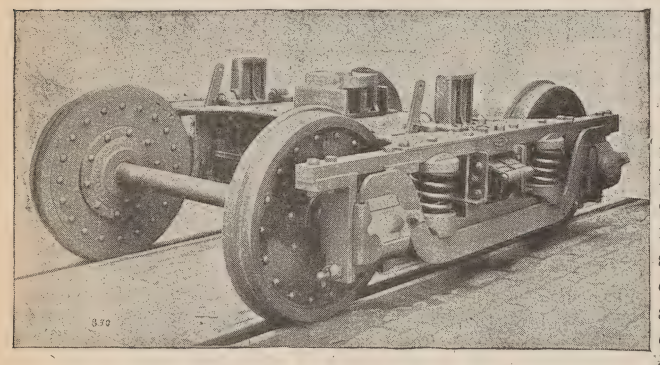
New Electric Cars for the New York, New Haven & Hartford R. R.

Through the courtesy of Mr. John Henney, Jr., Superintendent of Motive Power of the New York, New Haven & Hartford Railroad, we are enabled to present herewith photo-engravings showing the general construction of the new electric passenger cars built for the Nantasket branch of this road, which, as formerly (and first) announced in the NATIONAL CAR AND LOCOMOTIVE BUILDER is to be operated by electric power, and receive new rolling equipment for that purpose. As will be seen by our illustrations, the cars are of an exceedingly neat and attractive design and, excepting their large size, somewhat resemble the summer cars common on trolley street railways.



Electric Passenger Car, New York, New Haven & Hartford Railroad.

In our next issue we hope to publish a more extended description of these cars. They were built by the Barney & Smith Car Co., of Dayton, O. The trucks, however, were quilt by the Baldwin Locomotive Works, and one of our engravings reproduces a photograph of one of these.



TRUCK FOR NANTASKET BRANCH CARS.

This truck is very heavily built, having wrought iron side frames with loose pedestals bolted in position, and intermediate braces as well. The journal boxes are of cast iron, with heavy brasses neatly fitted to prevent variation in axle centers. The center plates and crossties are made of steel, and form the receptacle for the swinging bolster, which is also of steel. The bolster springs are double elliptic, and in connection with them there are provided the coil springs common to passenger car trucks to transfer the load to the equalizing beams and thence to the journals. All parts have been accurately fitted to gages, and every piece is interchangeable.

A Nebraska statute imposes a fine of $500 for each offense on railroad companies whose locomotives neglect to whistle for highway crossings. A farmer of that state who has had nothing else to do lately has counted 1,578 failures to whistle of St. Paul, Minneapolis & Omaha locomotives, and has begun a suit against the company in consequence for $78,900.

A train on the Manchester & Augusta Railroad, consisting of 15 freight cars and 1 tank car filled with kerosene oil, was burned near Rimini, S. C., recently. Some accident to the truck under the tank car is supposed to have knocked a hole in the tank. The oil was spilled along the track and ignited. Almost instantly the entire train was in a blaze, and it was with difficulty that one car next to the engine and three on the rear end were saved.

Work has been commenced on two new railroads in Southern Mexico that can hardly fail to be of immense benefit to that country. One is a line from Progreso, on the Gulf coast of Yucatan, to the frontier in the vicinity of Guatemala and British Honduras, and the other a road from Oaxaca south to the Tehuantepec Railway, which crosses the isthmus of that name from the Pacific Ocean to the Gulf of Mexico.

Locomotive Repair Shop Equipment.—IV.

BY W. H. WESTON, M. E.

(*Continued from page* 86, NATIONAL CAR AND LOCOMOTIVE BUILDER *for June.*)

In any general shop equipment the pneumatic air hoist is a piece of mechanism that is of very great value, and one that should not be omitted from the list, if efficiency of shop operation is to be secured. If put into use under proper conditions these tools cannot fail to give the best of satisfaction, and as they are a comparatively cheap machine, and one that is operated at a minimum of expense, there is no reason why they should not be employed in all shops doing railway work; not only for use at one or two machine tools, but they can be used to advantage at a number of points about a shop, as at boring mills, planers and lathes of large size, axle lathes, etc. The placing of work in the various machines and its removal when completed can be done by these hoists with a great saving in time and labor, both of which items mean money, and the saving of the latter is a very prominent element in shop operation everywhere.

Suppose a piece of work is going into a machine, and it is placed by the old hoisting car requiring the machine hand and a helper for five minutes. During this time, of course, the machine is idle, and the two employees are being paid for doing nothing, as you might say, because the same work could have been done automatically at far less expense; and five minutes, or even two or three minutes, anywhere from two to fifteen or twenty times a day at a dozen or more different machine tools, mounts up to a considerable figure in a year's running.

As to the proper construction of a pneumatic hoist I will not go into details, because it is a perfectly simple machine and easily made, so as to do good work if a little care is taken in the planning. Provided it is built amply strong and the piston properly packed, the air or operating valve is the most vital part, because the movement of the load in hoisting or in lowering is wholly controlled by this valve, and it must be so formed and the air passages of such size that sudden or uncontrolled movements will not occur. In placing the hoist on an overhead rail large rollers should be used in preference to the small 3 or 4-in. wheels usually employed, and the rail should be of steel and thick enough to give the rollers a good width of tread. As all railroad shops have air pumps in operation, or can easily place one in use, the compressed air is readily had.

Next, coming to the consideration of small tools, there is the greatest importance in having a well-regulated tool-room, and one thoroughly stocked with tools. The value of such an equipment has become more and more appreciated throughout the country, and not only are the large modern shops supplied with the best arrangement in this way, but many shops that are old and in which are machines that should be in the scrap, have fairly well equipped tool-room service. Yet this is not always the case by any means, and a great many shops, both large and small, could have an improvement made in this matter to the greatest advantage as to the cost of the work done by the shop and also its quality. A well equipped and well regulated tool-room is not only a great convenience in doing work, but it facilitates the production of good work to a marked degree. Another good result that is of hardly less importance is that the tools thus being carefully and properly attended to, will last a very much longer time than they do where the old lax methods are in operation, for tools that are ground and sharpened and forged by everyone, according to as many different notions as there are men, of course will be far from what they should be. And, besides this, there will always be a great many of them broken and lost where there are no strict regulations in regard to them. It is probable that in a shop where there are loose methods in regard to small tools that there will be at least 50 per cent. more tools made and bought than in a properly regulated shop; and at the same time there will invariably be a shortage of available tools that are in good order. The result always is that much time is lost in getting hold of needed tools for a job, and usually when found they will be in poor condition for work, and if a good workman gets hold of them he spends valuable time in putting them in proper shape for the job. If a poor workman or a shiftless one, as often happens, is doing the job he invariably will put the tools into use without taking the time to put them into decent working order. The result, of course, will invariably be that a large proportion of the work turned out by the shop will be far from good, and will also have taken a longer time to do. Thus it not only will be of an inferior quality but will have cost more than it would if good tools had been available when wanted, so that the work could have been performed effectively and quickly.

Nantasket Branch Electric Car New York, New Haven & Hartford Railroad.

As to the matter of lathe and planer tools, etc., they should be kept in stock in the tool-room, and a proper list arranged of small tools allowable to each kind of machine, and the man supplied according to the list, and when any one of the tools is used up it should be returned to the tool-room and a duplicate obtained. In regard to workmen in the erecting department and at the vise there should be a list of tools allowable to them, and they should be supplied accordingly and only given new tools as the old ones are used up. Such a list including, for instance, steel and copper or raw-hide hammers, wrenches, and in some cases pipe wrenches; an assortment of chisels, and one of files, and the necessary auxiliaries, as oil cans, file cards, etc. All other tools, such as twist drills, flat drills, reamers, taps, lathe dogs, clamps, milling-machine tools and cutters, wrenches, pipe cutters, pipe tongs, etc., to be kept in systematic arrangement in the tool-room, and when let out to workmen to be represented by a check or some other simple method until their return to place; the regulations in regard to the returning of tools to be strict and positive.

Another matter of great importance in this connection is to have an ample supply of standard gages and templets, and have all the work that can be done in accordance with them. This point of carefully arranging templets and gages for the standard portions of the work is of vital importance in securing accurate work and satisfactory results in the long run; for if portions of an engine are interchangeable, the repairing is vastly facilitated, and consequently costs less.

Of course, in taking an old shop that has been running for years in a bungling sort of a manner, it seems almost impossible to bring it to a systematic order of equipment nd regulation; yet this is the only way that work in a shop of any size can be economically done.

Any shop of moderate or large size should have a milling machine, a screw-cutting lathe and grinding machines in it, so that all the tools can be kept in order, and gages and templets readily made, and so that any special taps or tools of any description that might be wanted can be produced.

A supply room should be established separate from the tool-room, and a careful system of keeping it should be formed, so that not only the usual stock of brass fittings of all sorts is kept, but also a supply of all standard interchangeable parts, such as links, slide valves, pistons and rings, eccentrics, crank pins, etc., according to the special circumstances.

An Electric Rumor.

A report got started on June 13 that the Manhattan Elevated Railway, of New York, had awarded a contract to a Pittsburgh company for an entire electric equipment to supplant the present rolling equipment. That there is no truth in the report is evident from the following remarks of Vice-President and General Manager F. K. Hain, made on June 18:

"Some years ago we experimented on the Ninth avenue line with the Daft electric system. It was a failure. On the Thirty-fourth street line we also experimented with the systems of Stephen Field and Lieutenant Sprague. They too were failures. Now we shall let other people do the experimenting. What is going to be the cost is a very important question. Also, in case of a breakdown, at present there is only one engine to get out of the way, whereas with electricity, should there be a breakdown at the power station the whole line would be affected."

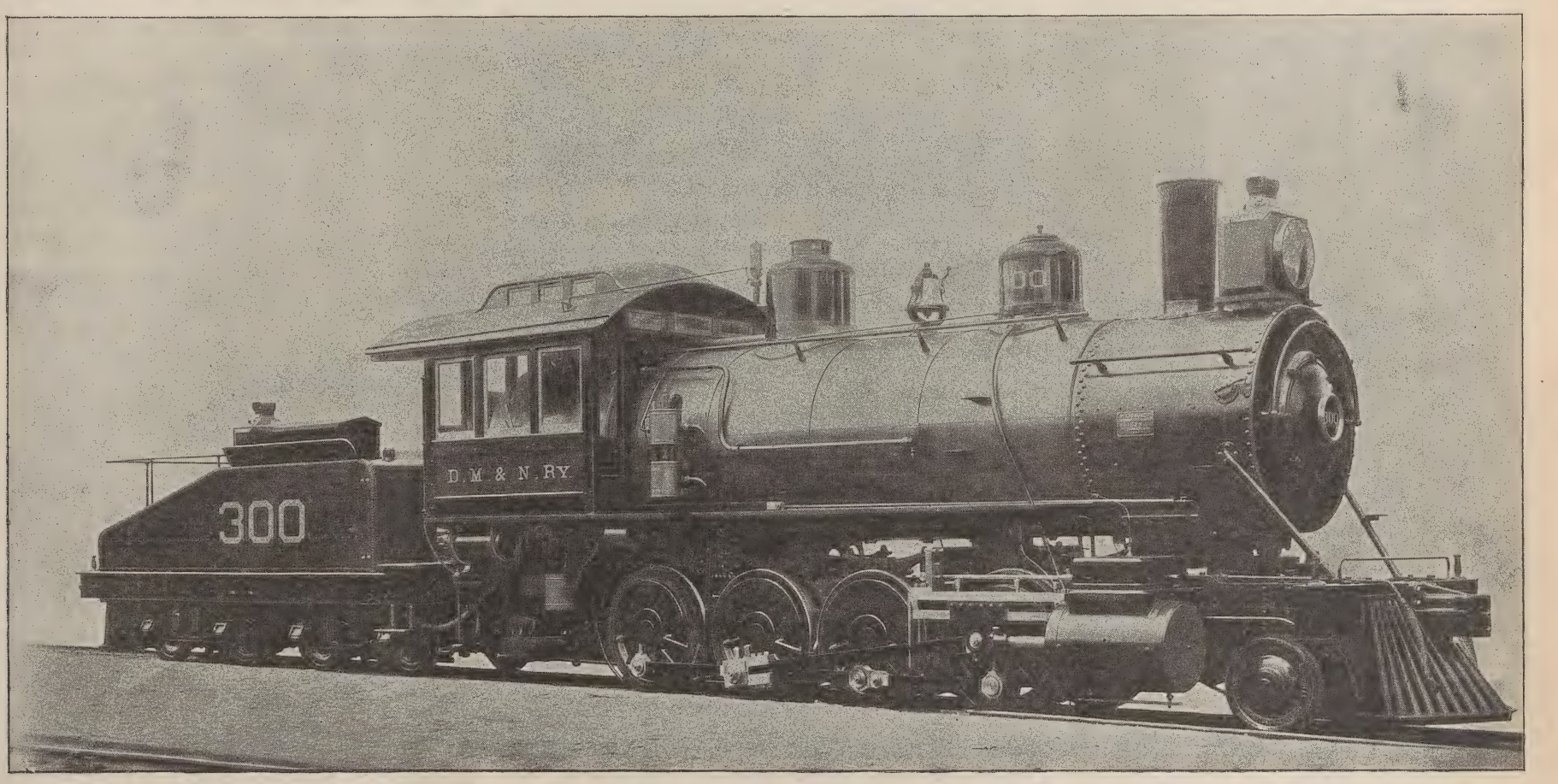
Steam Carriages.

Horseless carriages are becoming quite common in France. They are generally propelled by steam, the fuel being petroleum. A speed test of these vehicles has just been carried out on the course from Paris to Bordeaux and back, a distance of about 460 miles. The first prize, $8,000, was awarded to a four-seated petroleum carriage, one of a number manufactured by Les Fils de Peugeot Freres, which accomplished the round trip in 2 days and 53 minutes, being an average of 14.9 miles an hour. Seventy-six horseless vehicles participated in the test. This event is expected to give a notable impulse to the use of these new vehicles.

Heavy Freight Locomotive.

The accompanying engraving reproduced from a photograph shows the general construction of a very powerful and heavy freight locomotive built for the Duluth, Missabe & Northern Railway by the Pittsburg Locomotive and Car Works. It is designed to burn bituminous coal, and in working order weighs 161,000 pounds., of which 149,000 rest on the drivers. The driving wheel base is 14 feet, the total wheel base of the engine being 22 feet 1 inch, and that of both engine and tender being 51 feet ½ inch. The height of the top of the stack above the rail is 15 feet. The cylinders are 22 inches in diameter and have a 28-inch stroke. The piston-rods are of steel, 4 inches in diameter. Duplicates of this engine are now about completed for the same road. These locomotives are used for pushing empty cars up a two per cent. grade, seven miles long, from the Duluth ore docks to top of hill, back of the city. The usual load taken up is 620 tons of 2,000 pounds.

As seen in the engraving the boiler is straight, and 72 inches in diameter at the smallest ring, and 74⅝ inches at the back head. It carries a pressure of 160 pounds. The crown sheet is supported by radial stays 1⅛ inches in diameter. The stay-bolts are 1 inch in diameter, and are spaced 4 inches from center to center. There are 272 tubes 2¼ inches in diameter and 13 feet 6 inches long. The firebox is 121 inches long and 42¼ inches wide. It has a brick arch supported on studs.



DULUTH MISSABA & NORTHERN HEAVY FREIGHT LOCOMOTIVE.

The following table gives the dimensions of some further details:

Kind of grates	Cast iron, rocking
Grate surface	35½ square feet
Heating surface in tubes	2,149.2 " "
" " " firebox	169.5 " "
Total heating surface	2,318.7 " "
Diameter of driving wheels outside of tire	50 inches
" and length of journal	8½ inches by 9 "
" of engine truck wheel	30 "
" and length of journal	5 inches by 10 "
Type of tank	Sloping
Water capacity	3,600 United States gallons
Weight of tender with fuel and water	67,650 pounds
Fuel capacity	124 cubic feet
Type of brakes,	Westinghouse American Automatic La Chatelier Water Brake

Improved Service on the West Shore.

The West Shore Railroad began on July 24 its regular summer service, which is greatly improved over former years, many new local trains having been added to the schedule. The Washington, Baltimore, Philadelphia, Long Branch, New York, Catskill Mountains, Lake Minnewaska, Saratoga and Lake George cars began their regular trips. The local train service has been greatly improved. The time of the through buffet, drawing and sleeping-car service between New York, Toronto, Detroit, Cleveland, Chicago and St. Louis has been greatly shortened, arrangements having been made to run the day coaches and baggage cars on the New York, Chicago & St. Louis limited through without change.

Discipline Without Suspension.

Beginning June 1, the Chicago & Alton Railroad has adopted a rule discontinuing the practice of suspending employees in the transportation, machinery and telegraph departments for shortcomings. The idea of this is to avoid the consequent loss of time and irritation that such suspension produces, and instead thereof to keep a careful record of the men's shortcomings, and when it is demonstrated that they are not competent and safe men, to discharge them from the service.

The following is a copy of the order that does away with the old practice, for which we are indebted to the courtesy of Vice-President and General Manager Charles H. Chappell:

Records will be carefully kept in detail by the heads of each department, showing the service of each employee, whether good or bad. These records shall be confidential, as between the company and each individual employee; that is, any employee may be shown his individual record at any time he may desire to examine it, but he may not, under any circumstances, be shown the record of another employee.

When the individual record shall show an employee to be careless, indifferent, or incompetent, to the detriment of the company's interests, such employee will be permanently removed from the service. The removal, however, shall not take place until the record shall have been submitted to, and such action approved by, the General Superintendent.

Each employee will be notified promptly of all entries made in the record book opposite his name.

All employees start out with a clear record on June 1, 1895.

In the promotion of employees, their previous record will be carefully considered.

When an employee performs an especially meritorious act, it is desirable that the same shall be put on the record.

Each subordinate officer is cautioned and urged to see that information necessary to the proper keeping of the record of each individual, is promptly forwarded to the head of his department.

The Southern Railway Company has acquired control of the reorganized Georgia Southern and Florida Railway.

Mechanical Engineers' Convention.

The annual meeting of the American Society of Mechanical Engineers was held at Detroit, Mich., June 28. The following professional papers were read and discussed:

"The Old and the New," "A New Form of Sterilizer," "A Portable Disinfecting Plant," "The Strength of Iron as Affected by Tensile Stress While Hot," "The Effect of Length of Specimen on the Per Cent. of Ductility," "A T-square and its Mountings," "Efficiency of Boilers," "Force Required and Work Performed in Driving and Pulling Out Wire Nails," "New Forms of Friction Brakes," "A Horse-Power Planimeter," "A Coal Calorimeter," "Tests to Show the Distribution of Moisture in Steam when Flowing in a Horizontal Pipe," "Analysis of the Tremont Turbine," "Rustless Coating for Iron and Steel" (third Paper), "A Piece-Rate System," "The Down Draught Furnace for Steam Boilers," "A New Shaft Governor," "A Method of Proportioning the Cylinders of Compound Engines."

The Russian Government has decided, for strategic reasons, to extend the Trans-Caspian Railway from Samarcand to Marghilan, in Asiatic Russia. Marghilan is about 275 miles a little northeast of Samarcand. It is in the province of Fergana, one of the most fertile parts of Russian Central Asia.

Master Car Builders' Association Convention.

The twenty-ninth annual convention of this association met at Alexandria Bay, N. Y., June 11, with President John S. Lentz in the chair. The following members were present:

Adams, F. D., Boston & Albany.
Aldcorn, Thomas.
Ames, LaMott, Beach Creek.
Anderson, Thos., Pitts. & Western.
Anderson, Geo. T., Ind. Car and F'd'ry Co.
Apps, Wm., Ill. Cent.
Barr, J. N., Chic., Mil. & St. P.
Barber, J. C., Nor. Pac.
Barnes, D. L.
Bartlett, H.
Bean, John, Clev., Cant. & So.
Blackall, R. C., Del. & H. Canal Co.
Bowen, H. A., Swift. Ref. Car Co.
Bray, F. O., Lake Shore & Mich. So.
Brazier, F. W., Chic., Bost. & Liverpool Co.
Bronner, E. D., Mich. Cent.
Buker, Jos., Hicks' Stock Car Co.
Bay, J, P.
Bossinger, H. C., Ches. & O.
Bush, S. P., Pitts., Cin., Chic. & St. L.
Bushnell, R. W., Bur., Ced. Rap. & Nor.
Carlton, E. T., Balt. & O.
Canda, F. E., Canda Mfg. Co.
Carson, M. T., Mob. & O.
Casey, J. J., Ill. Cent.
Chamberlain, J. T., Bost. & Me.
Charpiot, S. A., Cent. R. R. & Bank. Co. of Ga.
Child, H.
Clifford, C. J., Bal. & Blue Id.
Coghlan, J.
Coller, Chas., Louisv., N. Alb. & Chic.
Cooke, Allen, Chic. & East Ill.
Cook, John S., Ga. & G. J. & S.
Comack, Wm., Wis. Cent.
Cory, C. H., Cin., Ham. & Day.
Coulber, H., Phil., Wil. & Balt.
Crone, S. A., N. Y. Central & H. R.
Cromwell, A. J., Balt. & O.
Davis, J. H.
Demarest, G. W., Nor. Cent.
Denver, J.
Devine, J. F., Wil. & Wel.
Dow, Geo. N., Lake S. & Mich. So.
Ennis, W. C., N. Y., Susq. & West.
Fildes, Thos., Lake S. & Mich. So.
Fletcher, J. B.
Forney, M. N.
Foster, Wm. A., Fall Brook.
Galbraith, R. M., St. L. S. W.
Garstang, Wm., Cleve., Cin. Chic. & St. L.
Geffcken, E., Sav., Fla. & West.
Gibson, O.
Gillan, B., New Orl. & N. E.
Grieves, E. W., Balt. & O.
Habswell, T. J., Flint & P. Marq.
Harrison, W. H., Balt. & O.
Haskell, B., Chic. & W. Mich.
Hawksworth, D., Bur. & Miss. R.
Hayward, H. S., W. Jersey.
Hennessey, J. J., Chic., Mil. & St. P.
Herr, E. M., Chic. & N. W.
Hodge, John, Atch., Top. & S. F.
Hoffecker, W. L., Cent. of N. J.
Holt, J. M., So. Ry.
Holtz, D.
Irvin, Saml., Mo., Kan. & Tex.
Keegan, J. E.
Keiber, Geo., N. Y. & N. E.
Killen, W. E., St. L., Chic. & St. P.
Kirby, John, Lake S. & Mich. S.
Leeds, P., Louisv. & Nash.
Lentz, J. H., Lehigh Valley.
Lewis, W. H., Chic., Bur. & Nor.
Lyon, Tracy, Chic. G. West.
Lungren, W. H., Phil., Wil. & Balt.
Kirby, T. B., Armour Ref. Line.
McCarthy, H. C.
McGee, F. H., Cent. R. R. & Bank. Co. of Ga.
McGregor, James.
McKenna, R., Del., Lac. & West.
McWood, Wm., Grand Trunk.
Macbeth, James, N. Y. C. & H. R.
McKenzie, John, N. Y., Chicago & St. L.
Marden, J. W., Fitchburg.
Marshall, R. E., Phil., Wil. & Balt.
Martin, M. M., Wabash.
Middagh, D. B., Norf. & West.
Mileham, C. M., Street's Car Line.
Miller, R., Mich. Cent.
Mitchell, A. E., N. Y., L. E. & W.
Morris, W. S., Ches. & O.
Nelson, E. D., P. R. R.
Neuffer, J. G., Balt. & O. S. W.
Paxson, L. B., Phil. & Read.
Peck, P. H., Chic. & W. Ind. & Belt.
Player, John, Atch., Top. & S. F.
Potter, G. L., P. R. R.
Pattee, J. O., Great Northern.
Rankin, J. H., Phil. & Read.
Rhodes, G. W., Chic., Bur. & Q.
Roberts, H., Chic. & G. T.
Roberts M., St. L., Iron M. & So.
Robertson, W. J., Cent. Vt.
Robson, A. C., Lake S. & Mich. So.
Sanderson, R. P. C., Norf. & West.
Simons, J. E., Pitts. & Lake Erie.
Skinner, J. R., Del. &. Hud. C. Co.
Smith, F. B., N. Y., L. E. & W.
Smith, P
Smith, C. A., Union Tank Line.
Soule, F. H.
Soule, R. H., Norf. & West.
Stark, F. H., Cleve., Lor. & Wheeling.
Stark, W. H., Wheel. & Lake E.
Steinbrenner, A. G., Am. Ref. Trans. Co.
Thompson, C. A., Port Reading.
Tonge, John, Minn. & St. L.
Townsend, J., Chic. & Alt.
Turner, C. E., Buff., Roch. & Pitts.
Voss, Wm., Barney & Smith Car Co.
Wade, R. D, So. Ry.
Waitt, A. M., Lake S. & Mich. S.
Watts, A. H.
Waughop, Chas., Joint Car Insp.
West, Geo. W., N. Y., Ont. & West.
West, Joel, Chi., Bur. & Q.
Williams, E. A., Minn., St. P. & S. Ste. M.

NEW MEMBERS.

Baby, J. A.
Chaffee, F. W.
Cleaver, F. M.
Dean, C. G.
Lavery, W.
LaLime.
Stewart, O.
McKenna, R. H.
Manning, J. H.
Millar, Wm.
Manning.
Manchee, S. H.
Mendenhall, C. M.
Sprigg, F. S.

Address of President Lentz.

In opening his address the President paid his compliments to the ladies, and mentioned the loss to the association in the deaths of W. T. Small, J. N. Lander and L. Packard; and suggested that the by-laws of the association be amended to provide that the proceedings be opened with prayer. He expressed his disapproval of amalgamating the two mechanical associations, but suggested that the M. C. B. convention meet Wednesday morning instead of on Tuesday as at present. This would save time. Continuing he said:

At the Saratoga convention your secretary read a communication addressed to the American Railway Association, asking its co-operation in urging the adoption of the standards agreed upon by this association; by your direction this communication was forwarded to the American Railway Association, which at a meeting held October 17, 1894, adopted the following:

"*Resolved*—That the details of car construction adopted by the Master Car Builders' Association, as published with the proceedings of its convention held in June, 1894, be and are hereby adopted as standard by the American Railway Association, and all railway companies and car builders are recommended to conform thereto as near as practicable."

By this action the Master Car Builders' Association has received well-deserved recognition by an organization which can, and no doubt will, contribute largely to the adoption of its standards. The question now arises, are we doing what we can to induce the proper officers of the roads we represent to adopt them? When we are called upon to draw up plans and specifications for new equipment, do we submit the standards, or do we ignore them, and submit something which we think is just a little better than has been adopted by the association? It appears to me that it is time that we awake to the fact, that if the membership of this association take home with them the inspiration they receive while attending these conventions, all of our standards will soon be in general use:

In order that there may be a full discussion on all questions that may be brought before the convention, I propose and ask for your consent to depart from the usual custom of parliamentary practice to this extent; when a motion is made to close the discussion, I ask the privilege of ascertaining for the information of the members if any one still wishes to talk further on the subject, and I would recommend an amendment to the by-laws providing for this change in practice.

The work accomplished by the Association is of such incalculable value not only to the railroads but also to the public in general, that I feel it incumbent upon me to make brief reference to it. So much has been done since its organization that it is rather difficult to define the same. The tests conducted by the committees of this Association, and their reports on the same, have been intelligent guides to railroad companies, so far as showing them in many instances the best design to adopt in car construction, as well as the materials to be used.

The fast time made by passenger as well as freight trains is in a great measure due to the efficiency of the automatic air-brake, which I claim is largely due to the investigations and tests made by committees of this association. Another important question—the adoption of the present M. C. B. type of coupler—is also due to the hard and efficient work of this association. Something better may be invented in the future, but I venture to say that the present coupler will have a long lease of life. I might enumerate other important standards, but, as they are familir to you all, I will not trespass upon your time in regard to them. I desire to call your attention to the revised edition of the M. C. B. dictionary prepared under the supervision of a committee of this association, and recently published. If properly used, it will undoubtedly in time bring about, as contemplated, a uniformity in the naming of different parts of cars; which is something greatly to be desired.

Referring to the subjects that were to be discussed, he said that the reports of the committees on the interchange of cars and on brakeshoe tests, were deserving of best attention. Brakeshoes, he said, cost the Lehigh Valley Railroad $23,000 a year. He suggested the appointment of a committee to devise plans and specifications for cars of 80,000 pounds capacity, and recommended careful attention to the subject of adopting a standard truck for cars of 60,000 pounds capacity, and a standard arrangement of draft gear attachments. He invited attention also to car doors and fastenings, and suggested that possibly the tread of car wheels should be changed to meet the new conditions of the heavier rails with broader heads now used. In closing, the President paid a deserved tribute to the good influence of the railroad clubs, and advised that encouragement be extended to the Master Car and Locomotive Painters' and Air Brakemen's associations.

The Secretary's report showed that the present membership of the association was 367, of which 214 are active, 148 representative and five are associate members. The increase in membership during the year was 33. The number of cars now represented is 1,151,957, an increase of 6,832 cars during the year.

The first reports presented were the majority and minority reports on the interchange of cars.

Interchange of Cars:

Last January the Committee on this subject sent a circular to the members of the association setting forth the facts in the matter of freight car interchange, and requesting an expression of opinion as to how much the force of inspectors could be reduced, if inspection was made for safety only, and an expression of opinion on the advisability of making car owners responsible for the condition of cars except in case of accident.

After citing these facts the report continues as follows:

Twenty-eight companies, representing 273,639 cars, are in favor of owner's responsibility, with proper restrictions, as outlined in second inquiry.

Four companies representing 26,923 cars, are not in favor of adopting this rule.

From this it would appear safe to assert that there is a sentiment in favor of placing the responsibility for repairs of cars on owners, on the same basis as wheels have been in the past, with exceptions, the exceptions being in nearly all cases in line with those incorporated in the rules of interchange between railroads c mmonly known as the Chicago interchange, and this is in line with the recommendations of the committees of the various clubs. If it were possible to live up to Rule No. 2, which reads—"Cars must be delivered in safe running order, and returned in as good general condition as when received," natural wear and tear being considered as included in the term "in as good general condition as when received," there would have been no hardship imposed.

The whole trouble, in our opinion, has been, that instead of being willing to interchange cars in safe running condition, they have been rejected not only on account of defects that bore evidence of having existed for a long time, and having been overlooked, or passed on a common sense inspection, but for blemishes which did not in any manner impair the efficiency of the car, and which would not have been repaired by owners.

The Committee in its circular of inquiry referred to the fact that the present mileage rate was sufficient to cover maintenance of cars, but upon further consideration it considers that it cannot with any authority discuss this question. Information which has been presented to the Committee, however, indicates that there would be no increase in charges under rules making the owners responsible with proper restrictions over the charges now paid under Rule 8, and upon defect cards, so if the present mileage rate is a fair one, it will still be just under the proposed rules.

To the question as to how many inspectors could be dispensed with, the answers range from none to 50 per cent., in many instances it being explained that where a large force was employed some could be dispensed with, while at small points of interchange they would have to maintain the same number, although they could handle more cars if necessary. This suggests a point which we consider essential. There is a great amount of running repairs which should be done under any rules without charge: *i. e.*, while any car should be constructed so as to withstand ordinary service, still, it cannot be reasonably expected to maintain itself even in safe condition without proper attention in tightening up, etc., and, in our opinion, Rule No. 1 should read. "Each railway company shall give to foreign cars while on its line the same care and attention as to oiling, packing and minor repairs, that it gives to its own cars." This would meet the objection that cars would be allowed to run down when away from home far beyond ordinary wear and tear, and as it would be reciprocal, would be equitable.

Upon the question of what should be considered evidence of unfair usage, it appears to be very generally conceded, that the statement on the bill that it was not so caused should be accepted, while others claim that the opportunity for dishonesty is no greater under a full responsibility of owners, than now. Others claim that clear evidence of the damage having occurred very recently should be noted by the receiving inspector, and a condition card demanded, not as authority for repairs, but as evidence in case of dispute. This is, perhaps, a good idea, but with past experience we cannot recommend it, as we would soon drift back to carding for blemishes.

There is one important feature in this matter. There have been replies to this circular representing but a small percentage of the ownership of cars, no replies having been received from many of the larger roads. The replies being so meager, we consider ourselves at least to some degree excusable if we have based our opinion on the general public expression, and our conclusion is that the rules should be modified as follows:

RULE 1. Add "and minor repairs" after the word "packing."

RULE 3. Opening paragraph to be changed to read as follows:

"Cars may be refused for any of the following defects: If, in the opinion of the roads they are unsafe to run, or unsuitable for carrying freight, or if they have defects for the repairs of which the receiving roads are not authorized to bill."

RULE 4. To add after the words "cross tie timbers" the following: "Such cards shall not be required for defects for which owners are responsible."

RULE 8. Should be modified to make owners responsible for repairs to their own cars when such repairs are due to ordinary service. With such restrictions as will guarantee owners from loss by unfair usage, such restrictions have been fully outlined in the recommendations of the various railway clubs to the Arbitration Committee, and in a general way the committee concurs with these recommendations.

PULASKI LEEDS, J. W. MARDEN, SAM'L IRVIN, J. N. BARR.

MINORITY REPORT.

There are three principal reasons that prompted this report:

1. The majority report does not appear to present the whole question for the consideration of your association.

2. The recommendations in the majority report are not apparently based on a logical reasoning from fair premises.

3. The plan recommended is at variance with well established business principles.

Under the first reason given, the objection to the majority report is that the subject is not fully presented. It is believed that the duty of a committee is to get all the information and to consider every plan that may be available for the purpose in hand, and to lay before the association at least the most important considerations for and against all plans that are in any way pertinent to the instructions given them. The subject assigned to this committee was:

"*Interchange of Cars.*—To suggest how cars in interchange may be maintained equitably to owners and operators with the least expense and detention." The majority report considers but one plan for giving relief to unnecessarily rigid or to congested interchange points. This plan, known as the "Chicago Agreement," makes car owners responsible for the cost of repairs of parts failing under fair usage while cars are away from the owning road. This may be the only practicable plan to overcome the delays at large interchange points, but it would seem due to your association, if this is so, to determine first whether the present rules have been wisely used, to point out how they have been inadequate, and also wherein other possible remedies fail. The majority report says that the whole trouble is due to cars being rejected either for defects that plainly have existed for a long time or for blemishes that have passed inspection points on a common-sense inspection. May it not, therefore, be asked whether, if we had a common-sense inspection at points where these serious delays occur, it will not remedy the evil? We know that common-sense inspection is applied at hundreds of points all over the country, avoiding wholly serious detentions and rendering unnecessary so radical a change as the plan proposed. It would appear that the committee should have made this clear, and allowed the association to be the judge whether the conclusion in the majority report represents the only solution of the problem.

As to the second point, that the recommendations of the majority of the committee were not based on the well-stated premises, it should be said that the only reason given for these recommendations is that "there is a sentiment in favor of placing the responsibility for repairs of cars on owners, and is in line with the recommendations of the committees of the various clubs." Although full consideration is due any recommendations made by the committees of the several railroad clubs throughout the country, it would seem

unfair to the Master Car Builders' Association to ask its members to accept these practically private recommendations without positive proof and without careful investigation.

Before considering the third reason for not agreeing with the report of the majority of the committee, it may be well to outline briefly the subject which has been assigned. It was practically to suggest a plan for eliminating the delays at interchange points and still maintain the cars equitably to owners and operators.

It is a question whether the determination of damage due to ordinary wear and tear or to rough handling will not introduce a more serious element of disagreement between inspectors than is now caused by the requirements of the present rules.

Referring now to the third reason given for not signing the majority report, namely, that the plan proposed is contrary to well-established business principles, the considerations against this plan of owner's responsibility are as follows:

1. That it is opposed to the fundamental principle upon which the Master Car Builders' rules have been built up and successfully used for many years. This same principle is applied by the business world to every business transaction involving the use of the property of one party by another. The essence of the principle is that the user compensates the owner by the payment of certain sums which are sufficient to cover the interest on the principal invested, taxes, insurance, ordinary wear, and lastly the depreciation which after the lapse of time renders the original investment valueless. The present M. C. B. rules operate in precisely the same manner. The user of a car belong ng to another railroad company pays a certain amount per car mile, and that amount continuously paid during the normal life of the car reimburses the owner in precisely the same manner as is the case with any other leased property.

The proposed change in the rules abandons the general and equitable principle, and owners are asked to furnish cars at practically no expense to the users but the car service rate, in perfect condition for use on other lines. That condition is gradually impaired by damage often repeated, until the car is no longer fit for service. It is then proposed that any company shall make the necessary repairs at the owner's cost, or return to him a car in an abnormally worn-out condition

2. The present mileage rate has been established upon the knowledge of the cost of repairs to foreign cars under the M. C. B. rules. It would, therefore, not seem proper to adopt a measure which may very seriously affect the earnings of cars on foreign railroads.

It is, of course, claimed in the majority report, that the bills against owners will not be greater than they now are under the present Rule 8 and upon defect cards. If the bills against car owners under the new system have been no greater than under the present Master Car Builders' rules, it is fair to presume that owners have been forced to repair their own cars when returned, owing to the general desire on the part of all railroad companies to be relieved as far as possible of work on any equipment which they can move safely in the direction of the owner. The bills, therefore, should be taken in connection with the increased amount of repairs, which the owners have been compelled to make, under the Chicago agreement, before the claim made can be considered fully sustained.

3. The proposed change allows any railroad company to repair a foreign car at its option and send bill to the owner, who must honor it. The owner has no means of knowing whether repairs have been properly made or whether material used is of the kind and quality he would select if he were repairing his own car. In the great majority of cases he will have to take it for granted that the work charged was done and was legitimately chargeable to the owner of the car. Certainly this is a violation of usual business precautions.

As any action of your association which will make a radical change in the present rules will seriously disturb the conditions affecting the ownership of cars and the question of borrowing the equipment, with its proper compensation, it would be injudicious to effect a change which may make the owning of cars a source of loss, and attack a policy devised and generally adopted by the responsible managers of railroads. E. D. NELSON.

The discussion of the matter of altering the rules of interchange as proposed in the majority report was probably the longest in the history of the association. We have space but for a very limited portion of the debate, and therefore select the following as simply showing the drift of the discussion:

Mr. Waitt: I have one or two thoughts in connection with this subject. The M. C. B. rules undoubtedly served a very valuable purpose in connection with the interchange of cars. They were adopted a number of years ago when business was comparatively small compared with the present time; when we did not have refrigerator cars with meat passing from one end of the country to another with almost express train speed; when the rules were quite simple; when carding was a new thing and it was not carried out to the extent it is now; when many of the new features that are causing trouble—M. C. B. couplers, air-brakes, etc.—were not in existence. The M. C. B. rules do not at the present time fulfill all the requirements of the service, as is shown by the fact that at all the large interchange points there are special arrangements broadening upon the rules but not in conflict with them. We have on our road in connection with the Pittsburgh & Lake Erie an agreement made a few years ago by which we allow either road to repair cars of the other and make a bill. At Youngstown, the point where we interchange, we stopped our inspection, merely keeping a man to look after hot boxes and anything that would interfere with the safe running of the cars. One man has done the work of five or six, and things go smoothly. We have arrangements at several points where we agree we will not set the cars back. It is necessary to prevent delays to traffic. Why not extend the same principle, as is proposed by the committee, by all of us agreeing to do the same thing—repair cars when they need it?

Mr. Rhodes: There is another question which comes up in connection with this subject which should be mentioned—why is it that this subject of interchange of cars becomes so prominent at the present time? Why was it not brought up before? Why didn't we discuss it two or three years ago? In a certain way we have discussed this subject at almost every convention. We have felt that there is a necessity for making some kind of provision for old defects on cars. It has been felt that it was not fair to saddle these old defects onto the railroad that happened to have the cars on its hands, and various means have been adopted to cover that ground. We have discussed cards of different colors, which would be issued for old defects. We have discussed various other methods to provide that cars with old defects must not be refused; but we have never succeeded in passing anything that has covered the ground properly. There would be too many flaws in them. At the last convention the plan of not issuing any cards at all was proposed and that old defects should be recognized as old defects. The discussion and action that took place surprised every one who discussed the matter. I was one of those who voted against the proposition last year. At the present time, after having had experience with the interchange of cars under the new interchange plan, we have changed our views and are in favor of the new interchange and propose to vote for it. What is it that makes this subject prominent at this time? It may not be so down in the East everywhere, but in the West there has been a heavy loss of business, and those in charge of expenditures have been put to their wits' ends to know how to make ends meet, and when we have seen the way in which our equipment has been handled, and the unnecessary expense that we are sometimes put to, we felt that some action must be taken.

I take it that one thing which makes the discusssion at this meeting perhaps not as full and square as it ought to be is that a great many come here, and are not voting about things as they know them; they are voting according to instructions from superiors. Without any disrespect to the superiors I do not believe that they are as competent to judge of these details as the master car builders are.

Mr. Nelson: As I understand the history of the Chicago agreement, it began by 12 roads in Chicago making an agreement to practically adopt the rules which are recommended by this committee's majority report. I am not intimately acquainted with the Chicago interchange, but I think history will show that other roads went into it after the original twelve had it in practice for sometime. Of course, those other roads, about forty-three, held back until they could see what the results were. Those who are in the Chicago agreement, are, as we know, enthusiastic about it; and the rincipal reason is that they were having so many difficulties there that it was absolutely necessary to adopt something radical. We know that times come when we have to make a choice between two evils; but my impression is that it has not been in practice long enough to develop such other evils as may come from it, and which may not come out until after it has been in force for some time. I do not think the association as a whole should adopt this at the present time. I do not think there is sufficient information as to the way in which it will work over large territory. We may come to this idea in some form or other, but I believe there are some indications that the agreement as outlined and practised at the present time may be profitably modified. Why not let these roads continue their agreement, and give the Association the value of their experience after it has been in use a longer time, so that we will be the better able to judge?

Mr. Mitchell: The New York, Lake Erie & Western Railroad Company was one of the first to enter the Chicago agreement. We were one of the original 12, and the agreement has given us relief in Chicago. There is no question about it; but I do not believe that we want to go into making the aggreement universal until we have had further experience with it. It has been in force only a short time, and we are constantly having disputes, and it will make an immense amount of work for the Arbitration Committee. I say let us continue that Chicago agreement for another year; let us settle our disputes, creep before we walk, and next year, if we see fit, the other roads can take it up.

Mr. Grieves: We know that the Baltimore & Ohio Railroad Company has been benefited by the new interchange at Chicago, and if this new interchange is a good thing at the greatest railroad center of the country, our feeling is that we want to try it at other points, and would like everybody else to go into it and see if we cannot make it a success.

Mr. Bronner: Some of the gentlemen speaking for the minority report have dwelt on the point that the only advantage we claim for this agreement is the saving of delay, and that they do not see that the country is suffering from delay to any great extent or we would hear about it from the general officers. Our general officers are always after us on account of delays to freight. We have been trying to develop a business in the South through the C., H. & D., one of our connections at Toledo—consisting largely of early fruit and vegetables, which are of a perishable nature. We found that on account of the delays from the operation of the M. C. B. rules at Toledo—although the rules had been greatly modified with the object of taking from them much of their rigor—we could not get the freight through. A committee from the Board of Trade, at Cincinnati, came up to see our president and the matter was talked over between the officers of the C., H. & D. and Michigan Central, who evidently knew something of the Chicago agreement, and they instructed the mechanical departments of the two roads to enter upon that agreement. I telegraphed to my foreman to give me the result of the operation of the Chicago agreement at Toledo. The result is as follows:

Week preceding our entering upon agreement interchange, of 284 cars; issued 31 defect cards and received 39 defect cards. We placed upon our repair tracks 35 cars of the C., H. & D. It is presumable they repaired as large a number of our own.

First week after the operation of the Chicage interchange, 251 cars interchanged, 2 defect cards issued by us, 4 received; repaired 3 of the C., H. & D. cars. Second week, interchange of 329 cars: issued 1 defect card, received 1; repaired 2 C., H. & D. cars.

The discussion lasted through the first day's session, without any definite action being taken. At the next session the following resolution, proposed by the arbitration committee, was adopted:

WHEREAS, some members of the Master Car Builders' Association desire to have the rules of interchange rearranged so that related matters occur together and instructions to inspectors be grouped for greater ease of reference, and that the form in general be changed so as to conduce to an easier understanding of the rules; therefore be it

Resolved, That the Executive Committee of the Association be instructed to request the Secretaries of the various Railway Clubs to have a committee of three representative members of the Master Car Builders' Association appointed from each of the six Railway Clubs, the committee of eighteen so appointed to take into consideration the general remodeling of the Master Car Builders' rules somewhat as proposed by the Southern and Southwestern Railway Club, and that the committee shall report the result of its deliberations to the Arbitration Committee, to be submitted to the convention of 1896 in its annual report. Members of the Arbitration Committee not to be eligible as members of the joint committee of the Railroad Clubs.

This session was devoted to discussing proposed changes in the rules of interchange. These were taken up one by one, and the following alterations made:

Rule 1.—The words "and minor repairs" added after the word "packing."

Rule 3.—Paragraph (r^1) amended to read as follows:

Wheels out of gauge, or wheels that measure less than 4 feet 5¼ inches, or more than 4 feet 5½ inches between flanges, or less than 5 feet 4 inches over treads. See Fig. 6a. This does not apply to wheels cast prior to Sept. 1, 1894. A new Fig. 6a shall be made similar to Fig. 6, to correspond with the dimensions given in paragraph. The measurements in both cases on Fig. 6 and Fig. 6a to be made at the same height on the wheel as the center of the axle.

Rule 7.—The words "locks, grain doors and inside parts of cars are at owner's risk, except where damaged by wreck or unfair usage" were added.

Rule 8.—Section (d) was amended to read: "Truck or body bolsters, end sills, center plates, draft springs, truck transoms, spring planks, or truck springs broken or lost, or arch bars broken or cracked, providing the car was not derailed or wrecked,"

Section (i) was amended as follows: "Cars with drawbars not within the limits of standard height, or cars without grabirons or handholds, as required by law."

A rule was adopted on motion of Mr. Barr, to go into effect July 1, to the effect that any cars which do not comply with the requirements of the law as to height of drawbar or as to equipment with handholds or grabirons may be repaired wherever found, at the expense of the owners, at a uniform price, to be fixed by the Arbitration Committee. This committee set the following prices for this work: Raising each end of a car, 50 cents; 20 cents for each grabiron applied.

Rule 10.—The following table of prices for wheels and axles was adopted:

	New.	Second hand.	Scrap.
One 36 inch wheel	$8 00	$6.00	$4.00
One 33-inch wheel	6.50	5.00	3.00
One 30-inch wheel [or less]	6.00	4.00	2.75
One axle, 60,000 pounds	8.00	5.00	3.50
One axle, 40,000 pounds [or under]	7.00	4.50	8.00

Rule 12.—The following is substituted for the last eight lines of rule 12: "In case the owner of a car removes a damaged wheel or axle, no charge shall be made for any difference in value between the parts used and those removed that are not damaged."

Rule 16.—The last eight words, "including a wrong drawbar in the latter case," are omitted.

Rule 18.—The last sentence of the last paragraph is changed to read as follows: "The splicing of two adjacent sills at the same end of the car, or any sill between cross-tie timbers, will not be allowed."

Rule 23.—The following table of prices for trucks is included:

With wood transoms, one pair, including brake-beams and brake-levers	$200
With metal transoms, one pair, including brake-beams and brake-levers	25₀

The following prices for M. C. B. couplers were adopted on motion of Mr. Waitt:

One malleable or steel coupler complete, as furnished by the manufacturers, $9.50; one malleable or steel drawbar casting, replaced, $5; one cast steel or wrought iron knuckle, replaced, including labor, $1.50.

The Executive Committee was authorized for future meetings of the association to provide a blackboard with accompaniments, the blackboard to be not less than 4 by 6 feet, so that the members may have the benefit of illustrations of matters under discussion.

A resolution was adopted at the third session authorizing three members to be added to the committee of 18, to be appointed by the railroad clubs to consider the rules of interchange, making that a committee of 21; the three additional members to represent private car lines and to be named by them, and also to be members of the M. C. B. Association.

The following resolution was offered by Mr. Barnes and adopted:

Resolved, That it is the sense of this meeting that suggestions from technical associations of railroad mechanics, as well as the Air Brakemen's association, as to changing of standards, recommended practice, and subjects for investigation, are agreeable to this association, and will be considered by the executive committee and presented to this association in convention, if found advisable.

The report of the Committee on Road Tests of Brake Shoes was then read by Mr. Soule.

Road Test of Brakes Shoes.

The general committee of 12 appointed by the Association (at its annual convention of 1893) to organize and conduct a series of service tests of brake shoes, made a preliminary report (by its executive committee of three) at the convention of 1894. In that preliminary report it was stated that of the 12 railroad companies represented by the membership of the original general committee of 12, five (the Pennsylvania, the New York Central, the Northern Pacific, the Chicago & Alton, and the Central Railroad of New Jersey) had subsequently declined to participate in the tests. The railroads represented by the other seven members of the original general committee of 12 (the Fitchburg, the Chicago, Burlington & Northern, the Chicago, Burlington & Quincy, the Chesapeake & Ohio, the Lake Shore & Michigan Southern, the New York, Lake Erie & Western, and the Norfolk & Western) have, however, conducted a series of such service tests. Each car under test had one truck equipped with soft cast-iron brake shoes (all of which were made at the foundry of the Pennsylvania Railroad Company at Altoona, Pa.), the other truck of each car being equipped with an outfit of some one of the 13 different kinds of special brake shoes which are included in the test; the brake shoes (including the soft cast-iron reference shoes) used being as follows.

STATEMENT OF EQUIPMENT USED IN SERVICE TESTS OF BRAKE SHOES.

Railroad Company.	Kind of Equipment.	With cast-iron wheels.	With steel tired wheels.	Total Equipment.
Fitchburg	Pass. Equipt. Cars	0	11	11
C., B. & N.	" " "	13	4	17
C., B. & Q.	" " "	13	13	26
C. & O.	" " "	8	5	13
L. S. & M. S.	" " "	12	13	25
N. Y., L. E. & W.	L'co'tive Tenders.	13	13	26
N. & W.	Pass. Equipt. Cars	12	0	12
Total		71	59	130

The equipment used by the different railroad companies in these service tests of brake shoes has been as follows:

The cast-iron wheels under the test equipment were principally 33-inch wheels; the steel-tired wheels were quite evenly divided between 33-inch, 36-inch, and 42-inch.

In the preliminary report of last year the committee pointed out that while the original intention was to calibrate the brake beam release springs under each car used in the test, that plan was subsequently abandoned on the theory that a sufficient number of shoes of each kind were to be tried to get fair average results, under which circumstances the differences in the resistance offered by the brake beam release springs under different cars might be disregarded. In working up the results of the tests this year, the committee concluded that they could also entirely disregard the question of brake leverages, owing to the fact that it seemed entirely safe to assume that on every car used in the test, the leverages and brake beam pressures were the same on both trucks.

In computing the relative service cost of the several brake shoes which were under test, it was necessary to work out

the actual net cost of the metal worn off. The reports from different railroad companies show that the scrap weight of brake shoes of all kinds tested varies but little from an average of about ten pounds. The method followed in computing the service cost was to take the weight and cost of one shoe new, and the weight and value of one shoe as scrapped; the difference in weights representing the metal worn off in service, the difference in the values representing the net cost of that metal, and the quotient arising from the division of one quantity by the other representing the net cost per pound of the metal worn off in service. The committee obtained from each manufacturer his statement of the present selling price and scrap value of brake shoes of his make. As the selling prices thus given by the manufacturers were, in several cases, regarded as confidential, the committee have not thought it advisable to reproduce them in this report. The final results derived from these computations are given in the following tables:

The final results in condensed form are given by the following statements, which show the cost (of each variety of brake shoe) relatively to the net cost of soft cast iron brake shoes for the same service; the results of the tests of brake shoes used against cast-iron wheels and used against steel-tired wheels being shown separately.

The term "Worn Out" indicates that according to the reports, the shoes were worn down to a minimum of thickness and weight without serious trouble from breakage. The term "Wear Irregular" indicates that some shoes wore out before others of the same kind, suggesting a want of uniformity in the metal of which the shoes were made.

In considering the condensed statements of results given, it should be borne in mind that the figures simply show the relative cost of different kinds of brake shoes when subjected to the same service, but that the actual relative economic value of different kinds of brake shoes can be determined only by combining the ratios above given with corresponding ratios which will express the relative amount of friction produced by the application of these several varieties of brake shoes under the same conditions. It is expected that the Committee on Laboratory Tests of Brake Shoes will inform the Association on this point.

R. H. SOULE, A. E. MITCHELL, W. S. MORRIS.

Representing the following General Committee on the Service Tests of Brake Shoes:

R. H. SOULE, W. H. LEWIS, S. A. CRONE,
A. E. MITCHELL, A. M. WAITT, J. C. BARBER,
W. S. MORRIS, J. W. MARDEN, JOS. TOWNSEND,
G. W. RHODES, SAMUEL PORCHER, W. L. HOFFECKER.

Mr. Waitt: I move that this report be received and discussion deferred until after the reading of the report of the Laboratory Test Committee. Carried.

The report of the Committee on Laboratory Tests of Brake Shoes was then read by Mr. Bush as follows:

Laboratory Tests of Brake Shoes.

In order to recall to the members of this association the manner of making the tests, a few words descriptive of the appartus, outside of the weighing and recording machines, may be desirable. It was decided to conduct the tests under conditions as nearly similar to those found in actual practice as could be obtained. A mass of metal in the form of a fly-wheel mounted on a shaft, having a weight equivalent to 11,995 pounds moving in a straight line, and capable of being moved by a stationary engine at any desired speed, was provided to represent the maximum weight that is carried on one journal of either a freight or passenger car. A chilled cast iron or steel-tired wheel mounted on one end of the fly-wheel shaft served to represent a car wheel in actual service. The different brake shoes to be tested were forced against this wheel with proper pressures by means of weights and levers. A trip was provided whereby the application of the brake shoe might be made to the wheel instantaneously. After the fly and car wheel had been brought up to the required speed the engine was shut off and disconnected by means of a clutch, the brake shoes applied to the car wheel, and the moving mass brought to rest through the friction developed, which was recorded by means of the apparatus provided.

Going now to the tests themselves, and the conditions to which the different brake shoes were subjected, a joint committee of the Committee on Road and Laboratory Tests decided on 14 shoes to be tested, as follows:

A—Soft cast iron, made by the Pennsylvania Railroad.

B—Hard cast iron, made by the Ramapo Wheel & Foundry Company.

C—Soft open hearth steel, made by the Solid Steel Company.

D—Hard open hearth steel, made by the Solid Steel Company.

E—Malleable Iron, made by the Dayton Malleable Iron Company.

F—Special S. T. malleable iron, made by the Dayton Malleable Iron Company.

G—Special C. W. Malleable iron, made by the Dayton Malleable Iron Company.

H—The Congdon Shoe, made by the Sargent Company.

I—The Meehan Shoe, made by the Sargent Company.

J—The Lappin Shoe, made by the Lappin Shoe Company.

K—The Safety Shoe, made by the Safety Brake Shoe Company.

L—Soft Steel (pressed), made by the Schoen Manufacturing Company.

M—Wrought iron (pressed), made by the Schoen Manufacturing Company.

N—The Sargent Special Shoe, made by the Sargent Company.

In order to test these shoes under the most severe conditions generally prevailing in freight and passenger service, the following was decided upon:

1. *Freight service.*—Chilled cast-iron wheel. Brake shoe pressure 2,793 pounds, corresponding approximately to 70 per cent. of ⅙ of the light weight of the heaviest 60,000 pounds capacity car. Speed, 40 miles per hour.

2. *Passenger service.*—Chilled cast-iron wheel. Brake shoe pressure 10,713 pounds, corresponding approximately to 90 per cent. of the freight on one journal of any one passenger coach, sleeping, dining or other car that may be hauled in passenger trains. Speed, 60 miles per hour.

3. *Passenger service.*—Steel-tired wheel. Brake shoe pressure same as above (No. 2). Speed, 60 miles per hour.

The brake pressures above given correspond to those generally used in this country at the present time. The brake shoes were all turned and ground to the wheel in order to insure a good bearing, and five tests of each shoe were made under all of the conditions above named, which number was afterward found sufficient, as may be seen by the uniformity of the results given in the tabulated statement.

The result to be obtained in making these laboratory tests was to determine the character and intensity of the friction given by the brake shoes above-mentioned.

The term "Coefficient of Friction" is used in the tabulated statement, and in order to make this term clear, it may be stated that the coefficient of friction is the relation of the total surfaces to the force pressing the surfaces together; in other words it is the proportion which the pull on a brake-beam hanger bears to the force with which the brake shoe is pressed against the wheel. For instance, where the coefficient of friction is shown as 20, it is meant that the pull on the brake hanger, or the retarding power of the brake shoe measured in pounds, is 20 per cent. of the force applied to the brake shoe through the brake beam.

In analyzing the results it will be observed that the prevailing practice in the United States in the matter of brake shoes for freight service, namely, that of cast iron, is, generally speaking, not far from the best yet known.

In the case of the passenger tests with a chilled cast-iron wheel, cast-iron shoes give the best, or among the best, coefficients. In the case of the passenger tests with a steel-tired wheel, the relation is somewhat changed, steel and wrought-iron shoes giving the highest coefficients.

The following notes taken after each test of the different shoes are presented to show the characteristics and incidents that could not be shown otherwise, from which it will be seen that in some cases the characteristics were such as to operate much to the disadvantage of some of the shoes that gave the highest friction coefficient.

Freight Tests.—In the casee of all the shoes, excepting H, I and K, the surfaces were found to have good bearing, sustaining no injury, neither were there any marked peculiarities of surface.

In the case of shoes H and I, the wrought-iron and steel insets flowed slightly, partially covering up the cast-iron parts of the shoes.

Shoe K gave a more uniform friction than any of the others, and it did not give the sudden rise at the end of the stop. It is a question how much of this was due to the wooden insets, and how much to the very soft iron of which the shoe was made.

There was no wear of the wheel after any of the shoes had been tested, although the surface was a trifle rough, due to small particles from the various shoes sticking to the tread; these, however, were easily scraped off. At no time was the wheel so hot that the hand could not be held on it without discomfort, although the shoes, in some cases, heated considerably, but not enough, it was thought, to effect their retarding power.

Passenger Tests, Cast-iron Wheel.—All of the shoes were fitted to the wheel accurately before commencing these tests.

After the tests it was found that shoes A, B, E, F, G, J and K did not have a full bearing at the ends, about 85 per cent of the total surface only having a bearing on the wheel. This was undoubtedly due to the intense heat generated by friction, which expanded the surface of the shoe in contact with the wheel and had a tendency to straighten it out, and thus make the bearing surface smaller. All of these shoes became red hot for a distance of about ½ inch up from the tread of the wheel during a single test, and from 20 to 30 minutes were required to cool them down with an air blast. The wheel also became warm, and after every five tests was allowed to cool down to nearly its normal temperature. Shoes A and B showed no other peculiarities than those above mentioned.

In the case of shoe C, the metal flowed under the intense heat and pressure, and the particles were carried to the end of the shoe which was last in contact with the wheel, where they piled up, partly fusing together.

Shoe D. had peculiarities very much the same as shoe C, but not quite so marked.

With shoe H, the wrought iron insets flowed over the cast iron in flakes about .02 inches thick, separating the cast iron from the wheel and reducing the area of contact of the shoe about 25 per cent. The shoe heated somewhat more than in the case of cast iron and malleable iron.

In the case of shoe I the steel insets flowed in the same manner as with shoe H, but to a greater extent, although the area of contact was about the same.

Shoe J, which was chilled cast iron, became red-hot during the test, and lost its chill entirely. After the tests, and the shoe had been cooled off, the face of the shoe could be cut easily with a file, while before the tests an emery wheel was required to cut the surface. After the chill has been removed the shoes might be expected to give the same result as hard cast iron.

Shoe K was composed of very soft cast iron, fitted with wooden insets $1\frac{1}{16}$ inches in diameter. These insets reduced the cross section of the cast-iron part of the shoe 49.4 per cent., which, combined with the softness of the iron, made it very liable to break. A crack appeared during the test of this shoe, which increased with each application of the brake, and at the end was so large that a light blow of a hand hammer broke the shoe in the middle where the crack was. The heat charred the plugs badly around the edges, and after this had taken place they did not present their entire section to the tread of the wheel; they also worked loose, and in practice would no doubt be liable to drop out when the shoe had been worn to about one-half its thickness.

Shoe L, soft pressed steel. The metal in this shoe flowed, but not to the same extent as with shoes C and E. It presented its full surface to the wheel both before and after the tests.

Shoe M, wrought iron. The metal flowed somewhat more than in the case of shoe L, but not so much as in the cases of shoes C and E. It presented a full bearing to the wheel after the tests.

Shoe N was composed of cast iron, with chilled iron insets, which were loose in the body of the shoe. These insets reduced the section of the cast iron about 50 per cent. It gave no marked peculiarities.

Passenger Tests, Steel-tired Wheel.—In these tests all of the shoes became much hotter than with the cast-iron wheel, although there was but little difference in the temperature of the wheel.

In the case of A, B, E, F, G and J the characteristics were very much the same; the iron in all of them was torn off in flakes varying in size from ⅛ square inch to ½ square inch; and in thickness from .0015 inch to .002 inch. The largest flakes came from shoes E, F and G, and the smallest from shoe B, varying with the hardness and toughness of the different irons.

Shoes C and D, soft and hard steel respectively, gave results similar to when tested with the cast-iron wheel, but more marked, and in addition when the metal flowed it piled up in a very peculiar manner, preventing contact with the wheel at the end of the shoe last in contact with it. When these shoes were examined at the end of the tests only about 70 per cent. of the their surfaces were in contact with the tread of the wheel.

Shoes H and I gave about the same results as with the cast-iron wheel, excepting that the metal flowed somewhat more and covered more of the cast-iron surface.

Shoe K broke during the second test. Another one was substituted, and this cracked so badly after the second test that it was broken with a hand hammer. The friction was the highest of all at the beginning of the stop, and at the end did not increase so rapidly. The excessive vibrations, or jerks on the pull rod, also did not occur. These latter characteristics are good ones, but it is not certain whether these are due to the wooden plugs or the softness of the iron.

While the friction of the various shoes, when used in connection with the steel-tired wheel, was greater than in the case of the cast iron, as might be expected, the steel-tired wheel showed slight signs of wear in all cases. However, the wear of the wheel was not enough to be measured in any way.

One very significant fact is presented by the results of these tests, namely, that the coefficient of friction, or retarding power, of brake shoes is greatly reduced under the conditions existing in passenger service, corresponding to the passenger tests. While the brake shoe pressure in the case of the latter was increased nearly 300 per cent. and the speed about 60 per cent., the coefficient of friction up to within a few feet of the end of the stops decreased about 50 per cent. This presents a condition which indicates that considerable further information is required.

WEIGHTS AND VALUES OF BRAKE SHOES USED IN SERVICE TESTS.*

Kind of Shoe.	Made by	Weight of one shoe. New.	Weight of one shoe. Scrap.	Wearing weight.	Net cost of metal worn. Per shoe.	Net cost of metal worn. Per lb.
		Lb.	Lb.	Lb.	Cts.	Cts.
A. Soft cast iron	Pennsylvania R. R. Co	22.0	10.0	12.0	25.0	2.08
B. Hard cast iron	Ramapo Wheel & Foundry Co	22.5	10.0	12.5	35.2	2.81
C. Soft O. H. steel	The Solid Steel Co	23.0	10.0	13.0	99.5	7.65
D. Hard O. H steel	The Solid Steel Co	23.0	10.0	13.0	99.5	7.65
E. Malleable iron	Dayton Malleable Iron Co	22.6	10.0	12.6	29.8	2.37
F. Spe. S. T. mal. iron	Dayton Malleable Iron Co	22.6	10.0	12.6	29.8	2.37
G. Spe. C. W. mal. iron	Dayton Malleable Iron Co	22.6	10.0	12.6	29.8	2.37
H. Congdon	The Sargent Co	22.2	10.0	12.2	37.4	3.06
I. Meehan	The Sargent Co	22.2	10.0	12.2	81.8	6.70
J. Lappin	The Lappin Brake Shoe Co	23.3	10.0	13.3	72.0	5.41
K. Safety	The Safety Brake Shoe Co	19.1	10.0	9.1	33.2	3.65
L. Soft steel (pressed)	Schoen Manufacturing Co	20.0	10.0	10.0	56.3	5.63
M. Wrought iron (pressed)	Schoen Manufacturing Co	19.5	10.0	9.5	55.0	5.78
N. Sargent special	The Sargent Co	22.8	10.0	12.8	61.4	4.80

* An average of 25 of each kind of shoes were used on cast-iron wheels, total, 332; an average of 18 of each kind were used on steel tired wheels, total, 236—grand total, 568.—ED.

CONDENSED STATEMENT OF RESULTS FOR BRAKE SHOES USED ON CHILLED CAST-IRON WHEELS.

Kind of shoe.	Wear by wt. rel. to soft cast iron for same service	Net cost per lb. of metal worn in cents.	Relative cost for same service in cents.	Cost rel. to soft cast iron for same service.	Remarks.
A. Soft cast iron	1.00	2.08	2.08	1.00	
B. Hard cast iron	.86	2.81	2.41	1.16	Wear irregular.
C. Soft O. H. steel	.17	7.65	1.30	.62	Wear irregular.
D. Hard O. H. steel	.10	7.65	.76	.36	Worn out.
E. Malleable iron	.53	2.37	1.25	.60	Worn out.
F. Spe. S. T. mal. iron	.83	2.37	1.97	.94	Worn out.
G. Spe. C. W. mal. iron	.83	2.37	1.97	.94	Wear irregular.
H. Congdon	.31	3.06	.95	.45	Wear irregular.
I. Meehan	.31	6.70	2.08	1.00	Wear irregular.
J. Lappin	.55	5.41	2.98	1.43	Wear irregular.
K. Safety	.70	3.65	2.56	1.23	Wear irregular and plugs fell out.
L. Soft steel (pressed)	.11	5.63	.62	.30	Cut surface of wheel.
M. Wrought iron (pressed)	.11	5.78	.64	.31	Worn out.
N. Sargent Special	.22	4.80	1.06	.51	Metal pieces fell out and broke.

CONDENSED STATEMENT OF RESULTS FOR BRAKE SHOES USED ON STEEL-TIRED WHEELS.

Kind of shoe.	Wear by wt. rel. to soft cast iron for same service	Net cost per lb. of metal worn, in cents.	Relative cost for same service in cents.	Cost rel. to soft cast iron for same service.	Remarks.
A. Soft cast iron	1.00	2.08	2.08	1.00	
B. Hard cast iron	1.06	2.81	2.98	1.43	Worn out.
C. Soft O. H. steel	.42	7.65	3 21	1.54	Very hard on tires.
D. Hard O. H. steel	.31	7.65	2.37	1 14	Tires very badly worn.
E. Malleable iron	.51	2.37	1.21	.58	Worn out.
F. Spe. S. T. mal. iron	.67	2.37	1·59	.76	Worn out.
G. Spe. C. W. mal. iron	.81	2.37	1.92	.92	Wear irregular.
H. Congdon	.30	3.06	.92	.44	Worn out.
I. Meehan	.21	6.70	1.41	.68	Worn out.
J. Lappin	.35	5.41	1.90	.91	Wear irregular.
K. Safety	.77	3.65	2.81	1.35	Shoes cracked and plugs fell out.
L. Soft steel (pressed)	.29	5.63	1.63	.78	Cut the tires very badly
M. Wrought iron (pressed)	.29	5.78	1.68	.81	Wear irregular and very hard on tires.
N. Sargent special	.33	4.80	1.58	.76	Metal pieces fell out and wear irregular.

In the report presented by your committee last year, it was suggested that in addition to determining the relative values of the brake shoes when subjected to the ordinary conditions of service, much additional and exceedingly valuable information might be obtained in the way of determining the exact variation in friction under different conditions of brake-shoe pressure and speed. The apparatus that has been provided is well adapted to the purpose; but such an investigation requires much more time than your committee has been able to devote to it thus far.

One thing that should be ascertained, in order to make the results obtained most useful, is the friction between car wheels and steel rails, on which depends the maximum braking power that may be applied to railway cars.

In carrying on its work your committee has been impressed with the fact that great variations in the retarding power of freight and passenger car brakes may result in service from the lack of uniformity in the friction furnished by the great variety of brake shoes used, notwithstanding the fact that the brake gear, in all other respects, may be adapted to giving the best results. Much time has been devoted to the development of air brakes and brake gear that will operate successfully within reasonable limitations, and it would seem that while certain standards have either been suggested or adopted by the Association covering brakes, it would be entirely proper to extend limitations to brake shoes as well. Your committee is not prepared to recommend anything in this respect at this time, but would present this matter, as well as others pointed out, for the further consideration of this Association.

S. P. BUSH, JNO. W. CLOUD, D. L. BARNES

Mr. Sanderson: I move that the report be received with the thanks of the association for the work done, and the committee be continued another year to clear up the points which they indicate still need experimental investigation.

Mr. Rhodes: In acting on that motion it will be well to bear in mind that these tests involve a great deal of expense and a great deal of time, which the gentlemen composing the committee hardly have at their disposal. The association has already paid out some money, but the expenses during the coming year will certainly amount to about fifteen hundred dollars.

Mr. Sanderson: I will include in my motion that the Executive Committee be instructed to provide funds, in their judgment, up to $1,500. Carried.

Mr. Bush: I think such an appropriation would more than cover the expense. The expense of carrying out this work has been considerable. The Westinghouse Air-Brake Company has been exceedingly liberal in assisting and the P., C., C. & St. L. Railroad Company has done what it could; and they would both appreciate very much an appropriation sufficient to cover the work yet to be done.

Mr. Barr: I make a motion to reconsider the action discharging the committee on road test. Carried.

Mr. Barr: I move that the committee on road test be continued to act in conjunction with the committee on laboratory test, and to make either a separate or joint report as they see fit. Carried.

Mr. Rhodes: Without going into the matter with much detail, I think the members of the convention would like to know in a general way from the committee, whether in the matter of metal for cast-iron wheels they have found that the brake shoes which are generally used, that is to say, the cast-iron shoes made of hard material, is the best material to be used against cast-iron wheels in freight service, or has some other metal been demonstrated to be better than that?

Mr. Bush: The safety brake shoe, which is composed largely of cast iron, gives the greatest friction and that gives the greatest retarding power. You can stop a train quicker with the soft cast-iron shoe in freight service than you can with any other. The question of wear does not come in. The result of the Road Test Committee indicates pretty clearly to what extent that question plays a part, and no doubt the joint committee will be able to tell definitely on this point at the next convention which of the shoes are the most practicable in all respects for freight service.

At the third session of the convention the first report read was that on Lubrication of cars.

Lubrication of Cars.

In the 1894 report we stated that it would be very desirable if a future committee could determine, by means of shop and service tests made with samples of different kinds and grades of oils, whether there was greater economy in low-priced or high-priced oils. Another recommendation made was that a special committee be appointed to consider "The Economics of Journal Bearings," as determined by shop and service tests. In view of the fact that both of these fruitful fields for study and investigation have been assigned to us, we can only treat the subjects in a somewhat superficial manner, and, pehaps, pave the way for further committee work at some future time, when the financial conditions of railroads will warrant them in undertaking and carrying through some series of tests on a scale elaborate enough to give real value to the results.

In connection with the subject for consideration, your committee has made careful inquiry as to the previous work done in this direction, and it finds that the subject was carefully gone into by a committee appointed for that purpose by the Standard Oil Company some five years or more since, and the results of the work accomplished by that committee will probably give greater light on the subject than any similar line of investigation that our association could make. A very complete description of the apparatus used, and some of the tests made, is given in the paper presented by Prof. J. E. Denton, of the Stevens Institute, before the 1890 meeting of the American Society of Mechanical Engineers, and as it contains the latest and most complete information on the subject known to your committee, by the courtesy of Professor Denton and with the permission of the Secretary of the American Society of Mechanical Engineers, we give an abstract from this paper in Appendix B, together with the illustration of the very complete apparatus used in the experiments, for the information of this association. An address by Professor Denton, Vice-President, Section D, of the American Association for the Advancement of Science, was delivered before that section, which is the section of Mechanical Science and Engineering, in August, 1890, on the "History of Attempts to Determine the Relative Value of Lubricants by Mechanical Tests." By the further courtesy of Professor Denton we have been enabled to reproduce this address entire in Appendix A, herewith.

At first sight it would seem that the apparatus described in Appendix B would be a very satisfactory method of getting a reliable comparative test of the values of different grades of oils, and also of the comparative service of journal bearings made of different mixtures. It would appear that the service conditions are as nearly reproduced as possible, but on inquiry being made of the lubricating department officials of the Standard Oil Company, your committee has been informed that the results obtained in the test apparatus vary so much from those obtained in actual service that the results cannot be relied upon as correct indications of comparative values of lubricants.

Some 10 or 15 years ago, at the instigation of a purchasing agent of a large railway system, an oil-testing machine was devised to reproduce as nearly as possible, within reasonable limits of expense, the service conditions on a car journal.

An extensive series of tests was made, and, based on the results, paraffine oil was selected as the *ne plus ultra* of lubricating oils. All went well so long as warm weather continued; but with the advent of ice in the atmosphere came fire in the journal boxes, for the oil, which was admirable in summer, became a solid mass in winter, and the results of the wonderful series of tests were annihilated, and the machine was laid aside as valueless; and it lies to-day covered with dust, a useless incumbrance in the shop where it was formerly used. We could conclude from these two illustrations that there are some conditions in actual service that cannot be reproduced in a machine for shop tests, and for really reliable results we must look to actual service tests under the most carefully restricted conditions.

The requirements for car journal lubrication are exceptionally severe. A successful oil must be capable of feeding freely at temperatures below zero, as well as at above 100 degrees Fahrenheit. It must not evaporate or become volatile under the high temperature of summers; it must be free from gummy or tarry elements; it must not only give good lubrication and prevent heating under favorable conditions, but it must also give good results when the conditions are more or less unfavorable. These necessary conditions your committee believes cannot be obtained, and are not being obtained, in actual service with low grade oils; and from the replies received from circulars issued in 1894, it would appear to be the general sentiment on the large roads in the country that the high grade oils are the cheapest in the end, all points being considered.

Your committee is satisfied that but little satisfactory data can be obtained from shop tests as to the economics of journal bearings. Reliable information must come from service tests under carefully regulated conditions. One important feature to be determined is the comparative wearing qualities of different mixtures of metal and the comparative wear on journals. To test this on a machine would require the machine to run continuously for several months to get data as to wear for one bearing only. In a service test several similar cars on a road could be equipped with different bearings, and in one or two years' time a great deal of information might be brought out. As it is necessary in forming a safe conclusion to have data from several different sources, it would be desirable to have a series of tests going on at the same time, on 10 or more roads located in different parts of the country, so as to make as great a variety of governing circumstances as possible. Such a series of tests would require great care in the outlining of the conditions and the observance of uniform rules of management, and they would entail some considerable expense of each road participating. Your committee still deem such a series of tests both desirable and practicable, but in view of the fact that the present condition of business on most of our roads demands unusual restrictions in the matter of expenditures, we would recommend that the subject of service tests in connection with lubricating oils and journal bearings be laid over until the better general condition of railroad business in the country will warrant its being taken in hand by a large committee in a similar manner to the brake shoe tests.

A. M. WAITT, W. H. THOMAS, J. E. WOOD, F. A. STINARD, W. K. CARR.

Mr. Barnes: As to the sentence at the top of page 3 of the report—"the general sentiment on the larger roads in the country is that the high grade oils are the cheapest in the end, all points being considered;" how are we to determine what makes high grade oil; and if shop tests cannot be made to show what is high grade oil, is it quite fair to decry shop tests as much as this report does? We have in this report omitted to give credit to the shop tests for what it is worth; and we are mistaking the errors of the machine. The machine is true, as far as it goes.

Mr. Waitt: It was not the intention of the committee to decry shop tests; but it has been shown by the experiments of a large oil company in this country—possibly the largest in the world—that the results of shop tests did not correspond with the results of actual service, as the conditions could not be fully reproduced, and therefore they did not deem it wise to continue experiments in that line. On some other points I have taken the ground that service tests were better to base final judgment on than shop tests, namely, in connection with the coupler question. I think the same is true with the oil question and journal bearing question; shop tests must be taken with a great deal of latitude because the actual conditions of service are not duplicated. Unless you are sure that the conditions are duplicated, you do not want to base a final conclusion on the shop test.

Mr. Hennessey: I think it is the fact that all roads have been giving more attention to repacking, taking old waste out of boxes and packing it very thoroughly. This additional labor ought to be counted in; consequently there is not so much reduction made as would seem to be the case.

Mr. Rhodes: The men who look after the oiling, in place of sitting down, have given more attention to the packing. We have not taken on any extra men.

Mr. Hayward: A factor which enters into the economy of oiling is the condition of our equipment, particularly the trucks, and nearly all roads in the last two years have been paying a great deal of attention to that matter in trying to economize. We have given more attention to truck repairs, and there have been larger sized axles and journal bearings introduced. In all cases where we find a large increase in our oil consumption and numbor of hot boxes, we immediately look into the condition of the brasses and the condition of the trucks, particularly in passenger service. In the latter case we find it is largely due to trucks being out of square.

Mr. Sanderson: In following up the question of lubrication, we found that where we thought the oils were at fault, sometimes the brasses were at fault. A little irregularity at the back of the brass, which may be bearing improperly on the journal or bearing too hard against the collar, would run the expense of hot boxes up very materially; also the matter of dust guards—seeing that covers were put in the dust guard grooves made quite a difference; also the question of fitting the journal backs; that has a bearing on the oil consumption and number of hot boxes. Road tests, however carefully carried out, will bear with them in all the uncertainties incident to a want of positive knowledge as to how well the brasses fit in the wedges; how true they are, how well the dust guards are kept up; how much oil is punched out of the backs by the loosening up of the waste. These points all have a bearing, besides the quality of the oil.

Mr. Grieves: Some five or six years ago the B. & O. was using cheap oil, 5 or 6 cents a gallon. We went into the use of the high-grade oil, 25 cents for freght and 35 cents for passenger. We found the first year we saved between $50,000 and $60,000, accomplished by a careful watching of our oil boxes and getting a first-class brass, and also gaging and having our brass bearings and wedges of proper dimensions. We watched our dust guards very carefully, and also had an inspector to see that the oil was not wasted. At this time we are still using high-grade oil, making 9.05 cents on freight and 30 cents on passenger cars per 1,000 miles.

Mr. Bronner: The gentlemen seem to attribute the favorable results obtained to the use of a high grade oil, and that the grade of the oil is regulated by the price. Judging by price, we are using a low grade oil; but we find we can run our freight trains at a cost of six cents a thousand miles, but we possibly may use more oil than some of the gentlemen using the so-called high grade oil. I think one of the reasons that they have reduced the cost is because the oil costs so much that they are forced to watch and economize more closely. If the same care was employed with the low grade oils they might get better results than they do. The principal economy comes in from the care of the details.

Mr. Cromwell: It is important to know what kind of bearings are used with the cheaper grade of oil. The B. & O. has made some very favorable showings in reduction of amount of oil consumed with the high priced oil, but with that we introduced the lead lined bearings on our road. I think that is one of the most important features in connection with the economy in our oil. At the time we used cheaper oil, we did not pay attention to the dust guards as we have since.

Mr. Soule: In '94 both the engine mileage and car mileage on the Northwestern system was greater than in '93 owing to the extension of the road to West Virginia. The money paid for oils in '94 was $19,000 less than in '93 That was due to a combination of circumstances. In '93 we used a high price oil; I am not sure that it was a high grade oil. We then made an experiment on one division in the lubrication of locomotives, to see if the ordinary black oil could not be used as well as the special engine oil. The experiment was successful and it was extended over the entire line. We were buying our oils entirely in barrels, but we now buy it in tank cars. We are reaping a great benefit from that. There was a great waste of oil from evaporation and leakage when the barrels were lying around. We ship oil now in drums. A great many oil cans will spring their joints and the oil is leaking; we have introduced pressed steel oil cans with brazed joints. There are no end of ways that you can discover in which money is being spent for oil and no benefit coming from it.

The report of the committee on air-brake and hand-brake apparatus on cars was read by the chairman, Mr. Bronner.

Air-Brake and Hand-Brake Apparatus on Cars.

The location of the hand-brake wheel on passenger equipment is not considered of great importance and no recommendation as to a standard location is submitted. The question of lack of power in hand-brakes is also met by a practically unanimous recommendation of no increase.

The question of charges against car owners for air-brake work having met with the approval of a majority of the members replying to our last year's circular, we submit herewith a scale of prices covering the labor charges for doing the work, and would recommend their adoption and incorporation in the M. C. B. code of rules as far as they are consistent with the action of the association in its revision of the rules at this convention.

An investigation of the "Standards for Air-Brakes on Freight Cars" reveals the fact that they are not especially well adapted to light-weight cars. To correct these difficulties, it has been suggested to your committee to recommend the use of a 6-inch brake cylinder or auxiliary levers on light cars. We find, however, that a proposition of this kind meets with general disapproval by the members.

From replies representing 290,612 cars, we find but one road, representing 17,312 cars, that is using truck levers 6.24 in. as shown in the standards. The truck levers for air brake freight cars in use on cars represented by those replying to our circular are in great variety, as shown in a table not reproduced here. The same interesting variety prevails in the cylinder and floating levers.

The practice of classifying cars upon which the same cylinder and floating levers shall be used, as shown by our information, runs from 1-1000 in. variation to 5-1000 in. variation.

In view of the fact that the 6.24 truck levers are evidently not suitable for general adoption, and on account of the diversity of practice shown your committee had in mind the presentation of standard truck levers and cylinder and floating levers and a system for the classification of cars. If this could be accomplished and adopted by the railroad companies, as well as by the association, it would no doubt be productive of much benefit. Out of the 290,612 cars represented in our replies, the representatives of but 98,549 think it practicable to adopt such a standard, while the representatives of 192,063 cars think not.

We, therefore simply present the conditions as they are:

LABOR CHARGES FOR PERFORMING AIR-BRAKE WORK.

Oiling cylinder, including oil	$0.05
Cleaning and oiling cylinder and marking date, including oil	10
Cleaning and oiling triple and marking date, including oil	10
Adjusting piston travel	10
Renewing one section pipe	10
Securing pipe to body	10
Renewing strainer	5
Repairing leaks at pipe couplings or unions	10

HOSE AND COUPLINGS AS NOW.

Applying dummy coupling	$0.05
Renewing defective coupling gasket	5
Renewing angle cock	5
Renewing angle cock handle	5
Renewing cut-out cock	10
Renewing cut-out cock handle	5
Repairing pressure retaining valve	20
Repairing release valve	10
Repairing release valve rod	10
Renewing cylinder body or reservoir, or both	20
Renewing cylinder gasket	20
Tightening up loose cylinder and reservoir	10
Renewing piston	10
Renewing piston packing leather	15
Renewing cylinder release spring	10
Repairing triple slide valve	40
Repairing triple emergency valve seat	10
Renewing triple valve gasket	10
Renewing check valve case	10
Renewing check valve case gaskets	10

E. D. BRONNER, PULASKI LEEDS, JAMES MCGEE, WILLIAM MCWOOD, W. P. SIDDONS.

Mr. Rhodes moved that the report of the committee be received and the committee discharged. Carried.

Mr. Higgins: It is unfortunate to pass over the location of the hand-brake wheel on our passenger cars. We all have more or less trouble with the old location when an ordinary passenger car is coupled to a sleeping car with the vestibule. It is not only troublesome, but in cases of a defective air-brake dangerous and causes delays. I do not think we ought to pass the point.

Mr. Bronner: The committee spoke of the point in their report last year, and intended recommending some location; but we found from the replies that very few members seem to think it was of much importance. The interchange of passenger cars, outside of sleeping cars, is comparatively small. The cars that would be interchanged would be coupled to sleeping cars, and it would not be of much importance. We waived recommending the standard.

Mr. Grieves: Was the committee able to ascertain from the answers why there was so much difference in the brake levers—live and dead levers?

Mr. Bonner: The levers we present show the levers used by the roads replying to the circular; some roads using several styles on their own equipment stated it was on account of the construction of the trucks, and that it would be impossible to use a standard lever unless there was a standard truck.

A motion was adopted providing for the appointment of a committee to go over all the standards of the association, "not with the idea of changing them, but to give information each year as to how extensively they have gone into use and whether there are any objectionable points which require serious consideration." The committee is to be appointed by the executive committee.

The committee on Automatic Couplers was unable to get together to prepare a report, and the committee was continued for another year.

The report of the committee on Passenger Car Ends and Platforms was read by Mr. Grieves, the chairman.

Passenger Car Ends and Platforms.

Your Committee, appointed to consider what improvements may be made in the construction of passenger car ends and platforms, would respectfully report that it has given its best attention to the subject, having consulted with various members of the association and collected drawings illustrating what is being done both by the railroad

(*Continued on page* 109.)

NATIONAL CAR AND LOCOMOTIVE BUILDER

ESTABLISHED IN 1870.
PUBLISHED MONTHLY
BY
R. M. VAN ARSDALE,
MORSE BUILDING.....NEW YORK.

GEORGE H. BAKER, Editor.

HERBERT W. POOL, Business Manager.

JULY, 1895.

Subscription.—*$2.00 a year for the United States and Canada; $2.50 a year to Foreign Countries embraced in the Universal Postal Union.*

EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING PAGES. *The reading pages will contain only such matter as we consider of interest to our readers.*

Special Notice.—*As the* NATIONAL CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, correspondence, advertisements, etc., intended for insertion must be received not later than the 25th day of each month.*

Contributions.—*Articles relating to railway rolling stock construction and management and kindred topics, by those who are practically acquainted with these subjects, are specially desired. Also early notices of official changes, and additions of new equipment for the road or the shop, by purchase or construction.*

To Subscribers.—*The* NATIONAL CAR AND LOCOMOTIVE BUILDER *is mailed regularly to every subscriber each month. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery, and in case the paper is not then obtained this office should be notified, so that the missing paper may be supplied.* **When a subscriber changes his address** *he ought to notify this office at once, so that the paper may be sent to the proper destination.*

THE CONVENTIONS.

The Master Car Builders' and Master Mechanics' conventions were held at Alexandra Bay in June, according to programme, and nothing of particular moment occurred to interfere with the usual course of their proceedings. The place selected was not easily reached by some of the members, but its natural beauty and attractions probably made amends to all who went for the trials of travel they had to endure to get there. The hotel accommodations were not as good as the members have been used to at Saratoga, or even at Lakewood two years ago. The place which seemed to be in most favor for holding the next conventions was Niagara Falls. This would be a good place to meet for many reasons, the chief of course being its easy accessibility from all parts of the country and its grand scenery. At the suggestion of the President, the master car builders' decided to hold their conventions hereafter one day later in the week, on Wednesday instead of Tuesday, thus shortening the time between their meetings and those of the master mechanics' that much. This is a good move, and will prove very acceptable to those who desire to attend both conventions, and will doubtless have the effect of noticeably increasing the attendance at both.

The master car builders showed a tendency to encourage debate more than usual this year, and in this matter set a good example that the master mechanics might follow with profit. It will be greatly to the advantage of the railroad interests of the country when matters that affect them are debated by the greater number of those who attend meetings for that purpose, instead of by the exceedingly small proportion who usually do.

The master mechanics might profit by another practice of the master car builders followed at the last convention, and this is in arranging the programme of their meetings so that the most important subjects, and those that will be likely to provoke the most discussion, will come first on the list. We are all squanderers of time, and are generally in a hurry at the last. This is so well recognized, that even those who may be eager to discuss the subject under consideration have not the courage to do so when it comes up at the tail end of a great convention, when nearly everybody is manifesting their anxiety to get away.

The greater part of this issue is devoted to a report of the proceedings of the master car builders' convention, and we have succeeded in presenting therein all but one of the committee reports, and the gist of the discussions of them.

IMPROVEMENTS IN DISCIPLINE

Several large railroads have within the past year discontinued the practice of suspending employees for the many happenings in operation that these men have usually been punished for by stopping their pay for 10, 20 or 30 days, consigning them to idleness in the mean time, and those dependent on them for support to the hardships entailed by being deprived of their usual income. The long days of idleness to those accustomed to the activities of railroad service are, during suspension, only too often passed in ways that lower the moral character and future efficiency of the men involved; the suspended income encourages running in debt, and the general effect is to breed in the individuals an antagonism to the officers who inflict the punishment, and to the interests of the company they represent. It is folly to preach to the employees of a railroad about the interest they should take in the company's welfare and in the economical performance of their work when they receive constant manifestation that the company (or those who to them represent the company) cares nothing for them, their welfare or their condition. An officer "of the old school" once said in our presence, "When the pay car comes it cancels all our obligations, and we don't care a damn for the men." Happily, the time has come when this attitude is considered unwise, as well as unfair.

An exceedingly good practice is that in vogue on at least one road (the Pittsburg, Cincinnati, Chicago & St. Louis), to give due credit for good performances of any kind. This is a form of practical encouragement that must certainly call out the best efforts of those concerned.

LOCOMOTIVE BOILER FEEDING.

The question of how locomotive boilers ought to be fed with water came up rather unexpectedly during a session of the late master mechanics' convention while the subject of "Causes of Bulging of Firebox Sheets" was being discussed. A prominent member stated that to avoid injury to boilers he instructed the engineers on his road not to work injectors under any circumstances unless the engines were using steam, stating further that when injectors were worked while the engines were idle or running shut off serious results followed when steam was again used and circulation re-established inside the boiler—the cold injection water chilled the sheets. The correctness of the proposition was immediately denied by another member present, and a somewhat heated discussion of the point followed. It was a digression, however, from the main subject under debate, and was properly ruled out of order by the President. It is a matter for regret, however, that on the motion of a member the discussion of this important phase of locomotive management was stricken from the minutes.

In the management of a locomotive there is no way by which an engineer or fireman can more largely influence for good or evil the cost of fuel and boiler repairs than by the judicious or injudicious use of the injector. Certainly any method of using it that will chill the boiler deserves condemnation. But does the use of an injector chill a boiler when the locomotive is idle or running shut off? This depends entirely on the condition of the fire. Usually this is so hot for the first two or three minutes after shutting off steam with an ordinary fire on the grates that no chilling effect takes place. Of course the injection could be continued until chilling did occur, or it could be continued when the fire was at such a low heat that the same thing would happen, because sufficient heat would not be supplied to make the steam used by the injector, and the further amount needed to raise the *hot* injection water to the temperature of the contents of the boiler.

We lay stress on the fact that the injection water is hot. It is, indeed, much more so than it is generally understood to be. At the session of the convention referred to, it was repeatedly stated to be usually about 140 degrees Fahrenheit. This is an error, as the usual temperature of delivered water with the eight injectors in widest use exceeds 200 degrees, some supplying the water as hot as 237 degrees and 279 degrees from feed water at 80 degrees, and delivering it as high as 218 degrees and 278 degrees from feed water at 60 degrees. This with 140 pounds boiler pressure. Steam of this pressure is about 360 degrees hot, and the normal temperature of the water in contact with it in the boiler is the same, so the temperature of the injection water is approximately within 100 degrees of the temperature of these contents.

It is apparent that under these conditions there is no danger of chilling the boiler unless the injection is continued excessively while the fire is not stimulated by the exhaust. In both theory and practice the line is drawn *at a change of boiler pressure.* When this is 140 pounds the temperature of the boiler and contents is about 360 degrees, as stated. As long as this pressure is maintained so also is the temperature, no matter whether the pressure is maintained by stimulating the fire with the exhausts from the cylinders, or by the blower, or whether the natural draft acting on the fire is sufficient to generate the necessary heat. This latter is very generally the case during the first several minutes while running after shutting off steam, and is very frequently the case with engines running rapidly shut off for some time owing to the fanning action of air expelled from the cylinders through the nozzles.

Mechanical officers who instruct their enginemen to not work injectors except when the engines are using steam in the cylinders pursue a most effective plan of wasting a very considerable amount of coal. The method they teach is unscientific and bad practice. In the old days of pumps it was all right, because these supplied the boiler with *cold* water, that when forced in while the engine was running shut off, and when there was no circulation in the boiler, did result in chilling and damaging the boiler when steam was again used and circulation re-established. With injectors the conditions are entirely different, and while the injector is working a very complete circulation is maintained, steam being taken from the back of the boiler and re-entering it with the feedwater at the front.

At the risk of being charged with repetition, we quote the following short abstract from a paper on Locomotive Injectors, read to the New York Railroad Club at its last October meeting, in which the matters above alluded to are treated more specifically:

"In service injectors should be operated so as to secure the most economical results that they are capable of effecting. Generally this is not done, and many enginemen who operate injectors do so much as they would a pump, regulating it to supply an equivalent of water to the boiler as used, and suspending injection as much as possible when the engine is not working steam. The practice is wasteful of fuel, and no good results from it. With pumps such practice was necessary for the preservation of the boiler. This may be illustrated as follows: A locomotive running some distance shut off with the pump working would apparently suffer no diminution of steam pressure until the throttle was opened, when the pressure, as shown by the gage, would immediately fall anywhere from 20 to 60 pounds; the amount depending on the quantity of cold water that had been pumped into the boiler while the engine was running shut off. Of course, the change of temperature, accompanying so great a change of pressure, caused damaging consequences to the boiler, which showed themselves in broken staybolts and leaking flues. The cause of the apparent rapid change of pressure was due to the fact that the cold water pumped into the boiler while no steam was being used, and, consequently, when there was practically no circulation in the boiler, sank to the bottom of the boiler, by its gravity, leaving the hot water in contact with the steam at the top. Heat almost invariably travels upward. Under these conditions the cold water could not impart its cold to the hot water above it, or mix with it, except very slowly, and neither could the hot water impart its heat downward to the cold water below, or mix with it except very slowly. This state of affairs allowed a large quantity of water to be pumped into the boiler while the engine was running shut off, without affecting the steam pressure as indicated by the gage, even if the fire was at low heat. But immediately steam was used, either by the cylinders or the blower, circulation was established, the steam resting on the hot water was rapidly used up and the pressure as rapidly fell, so that by the time the hot and cold water became thoroughly mixed a considerable fall of pressure had taken place.

"The operation of the injector being entirely different from the pump, no such evil result as this follows its use when the engine is standing or running shut off. The steam used in the injector causes a constant circulation within the boiler, and any fall of temperature of its contents is immediately made manifest by a fall of pressure shown on the gage. The economical advantage of putting water into a locomotive boilor while the engine is idle or running shut off results from the fact that in this way the necessary rate of combustion is lowered. The fire may be kept hotter while the engine is stopping at stations, and it need not be made so hot when the engine is working hard. This equalization of the rate of combustion is highly conducive to economy of fuel. Injectors should be operated so as to replenish the boiler as much as practicable while the engine is not using steam, and should be adjusted to the finest practicable feed while the engine is working hard."

The simple fact of the matter is that so far as affecting the boiler itself is concerned it is of no importance how much water (within the capabilities of the boiler) is injected, or how rapidly it is put in while the engine is standing or running shut off, as long as the steam pressure is kept from varying. It is only in consequence of such variation that there can be any variation of temperature and the resulting injurious movements of expansion and contraction of the metal forming the boiler. Doubtless much damage is done locomotive boilers by injudicious boiler feeding, allowing the injection to seriously and often suddenly reduce the pressure and consequently the temperature; but this results from the prevailing ignorance of enginemen that such practice is injurious to the boiler. They regard changes of pressure in the boilor about the same as changes of pressure in the compressed air reservoir. They should be instructed in regard to the facts of the case.

One of the oldest engineers on the Central Railroad of New Jersey, and one of the oldest steamship pilots in New York harbor were each stricken with paralysis while at their respective posts, on running locomotive and plowing ship, recently. The engineer died instantly in the cab, and the pilot was carried helpless from the bridge. These regrettable events happened within a few days of each other, and constitute an impressive object lesson of the uncertainty of human life and action, and demonstrate that implicit reliance cannot safely be placed on the ability of any one man to always perform his expected duty.

Our esteemed Chicago contemporary, *Railway Engineering and Mechanics*, has again assumed its old well-known name, the *Railway Master Mechanic.* We are glad of it, and doubtless many others will be also. Simplicity in the name of a journal is of nearly as much importance as simplicity of construction is in a machine. Those who have to pronounce the names of journals almost invariably choose the easiest way to indicate the particular journal. This is natural, and is a proper economy of effort and the attention of others

The International Railway Congress.

The fifth meeting of this congress, in London, June 26, is of more than usual interest to American railroad men, because for the first time there is a good representation of these in the congress, representatives being there from the Pennsylvania, New York Central, Lehigh Valley, Fitchburg, Nashville, Chattanooga & St. Louis, Denver & Rio Grande, Arizona Southern, New York, New Haven & Hartford, and a number of other railroads.

The Prince of Wales made the opening address at this meeting, and in a felicitous way paid a special compliment to the American delegates, saying this was the first time the Railway Congress had the pleasure of welcoming them. Referring to the former congresses, he said that, while they could not promise the delegates the beauties of Italy or excell in splendor the reception accorded them by the late Czar at their last meeting, he thought it would profit them to visit the Manchester, Crewe and other great works. The prince added that he would venture to say this "even to the delegates from the United States, that great country which owns half the mileage of the world."

The first business meeting of the congress will be held July 1. The first banquet (the number of delegates being so great two banquets are necessary) will be given by the Railway Companies' Association July 2, the second July 4. The American delegates will attend the latter banquet. On July 3, 4, 5 and 6 there will be meetings of the congress, and during the afternoon of July 6 the delegates will be received by the Queen at Windsor Castle. The Railway Companies' Association will give a banquet July 8. The meetings will close July 9, to be followed by excursions and an inspection of the famous Forth Bridge.

Badges for Past Presidents of the Mechanical Associations.

Each of the living past Presidents of the Master Car Builders' and Master Mechanics' Associations was presented with a very handsome badge by the entertainment committee of the recent conventions. The badges are made of gold and enameled in blue and red. Each has the recipient's name engraved on one side, as well as upon the bar. On the face the years of his tenure of office are marked.

These presentations were made to the following named gentlemen of the Master Car Builders' Association:

Messrs. I. W. Van Houten, of the Pennsylvania Railroad, President 1867 to 1869; F. D. Adams, of the Boston & Albany President in 1870; M. C. Andrews, formerly of the Boston & Maine, President 1871 to 1873; William McWood, of the Grand Trunk, President 1887 to 1889; John Kirby, of the Lake Shore & Michigan Southern, President 1890 to 1891; E. W. Grieves, of the Baltimore & Ohio, President 1892 to 1893, and John S. Lentz of the Lehigh Valley, the present President.

Those of the Master Mechanics' Association are as follows: Messrs. Reuben Wells, of the Rogers Locomotive Company, President 1881 to 1884; J. Davis Barnett, of the Grand Trunk, President 1885 to 1886; Jacob Johann, of the Chicago & Alton, President 1886 to 1887; J. H. Setchel, of the Pittsburgh Locomotive Works, President 1887 to 1889; R. H. Briggs, of the Kansas City, Memphis & Birmingham, President 1889 to 1890; John MacKenzie, of the New York, Chicago & St. Louis, President 1890 to 1892; John Hickey, of the Northern Pacific, President 1892 to 1894; William Garstang, of the Cleveland, Cincinnati, Chicago & St. Louis, President during the last year.

A Weather Recorder.

At the meeting of the New England Meteorological Society at the Institute of Technology recently, a new and remarkable piece of apparatus was exhibited by Mr. S. P. Fergusson, of the Blue Hill Observatory. The instrument, which is called a meteorograph, is for the purpose of recording weather conditions at elevated stations, where it is impossible to maintain a staff of observers.

The instrument, which has been made at less than half the cost of a similar French instrument, will record the height of the barometer, the temperature, the direction and velocity of the wind and humidity of the atmosphere, and, like the French instrument, will require attention for winding and the insertion of new record blanks only four times a year, every three months. The instrument is intended for the El Misti station of Harvard College observatory. This is at the summit of the volcano of that name near the Arequipa branch observatory, at a height of 19,300 feet, and was established in 1893, since which time a weekly ascent has been necessary to care for the instruments.

The Chicago Great Western has arranged with the Safety Car Heating & Lighting Company to use Pintsch gas in its sleeping cars between Chicago and St. Paul, and St. Paul and Kansas City.

Dr. von Bebber, a German meteorologist, says that when the outside temperature is 50 degrees the temperature of the coat is 71.2°; between the coat and waistcoat, 73.6°; between the waistcoat and shirt, 75.9°; between the shirt and undershirt, 77.4°; between the woolen undershirt and skin, 90.9 degrees.

Safety Conditions of Cars Required After July 1.

At a meeting of the Interstate Commerce Commision held in Washington June 13, it was decided to issue the following notice relative to the safety appliances (secure hand-holds and grabirons) required by law on all cars used in interstate traffic after July 1 of this year; and relative to the standard height of drawbars of all such cars:

WHEREAS, The act of Congress approved March 2, 1893, and entitled "An act to promote the safety of employees and travelers upon railroads compelling common carriers engaged in interstate commerce to equip their cars with automatic couplers and continuous brakes, and their locomotives with driving wheel brakes, and for other purposes," provides among other things, as follows, to wit:

Sec. 4. That from and after the first day of July, 1895, until otherwise ordered by the Interstate Commerce Commission, it shall be unlawful for any railroad company to use any car in interstate commerce that it is not provided with secure grabirons or hand-holds in the ends and sides of each car for the greater security of men in coupling and uncoupling cars.

Sec. 5. That within ninety days from the passage of this act the American Railway Association is authorized hereby to designate to the Interstate Commerce Commission the standard height of drawbars for freight cars, measured perpendicular from the level of the tops of the rails to the centers of the drawbars, for each of the several gages of railroads in use in the United States, and shall fix a maximum variation from such standard height to be allowed between the drawbars of empty and loaded cars. Upon their determination being certified to the Interstate Commerce Commission, said commission shall at once give notice of the standard fixed upon to all common carriers, owners or lessees engaged in interstate commerce in the United States by such means as the commission may deem proper. But should said association fail to determine a standard as above provided, it shall be the duty of the Interstate Commerce Commission to do so, before July 1, 1894, and immediately to give notice thereof as aforesaid. And after July 1, 1895, no cars, either loaded or unloaded, shall be used in interstate traffic which do not comply with the standard above provided for.

And Whereas, The said American Railway Association did, on the 26th day of May, 1893, and within a period of ninety days after the passage of said act, duly file with this commission a certificate showing that the said association had, pursuant to the provisions of section 5 of said act, designated and determined that the standard height of drawbars for freight cars, measured perpendicular from the level of the tops of the rails to the centers of the drawbars, for the standard gage railroads in the United States shall be thirty-four and one-half inches, and for the narrow gage railroads in the United States shall be twenty-six inches, and that the maximum variation from such standard height to be allowed between the drawbars of empty and loaded cars shall be three inches; and the commission having thereupon notified all common carriers, owners, or lesses, engaged in interstate commerce in the United States, of the standard height of drawbars so prescribed, and of the variation from such standard height so prescribed, for or between empty and loaded cars, by order entered on the 6th day of June, 1893, and by notice duly given and published to all such common carriers:

And Whereas, This commission is required by the terms of said act to secure the enforcement of its provisions;

And Whereas, In view of the penalties which carriers are liable to incur through hauling, or permitting to be hauled, or used on their lines any car in violation of any of the provisions of said act, irrespective of the ownership of such car, it seems advisable that common carriers engaged in interstate commerce should be further notified that said sections of the law will be in force from and after July 1, 1895;

It is Ordered, That all common carriers by railroad be notified that the provisions of Sections 4 and 5 of said act of March 2, 1893, will be in force, and become operative from and after the first day of July, 1895, and that such notice be given by service of a copy of this order by mail upon each known railroad carrier in the United States engaged in interstate commerce, and the secretary of this commission is hereby directed to make such service forthwith.

It is Further Ordered, That each common carrier so served with a copy of this order, be and is hereby requested to file with the secretary of this commission on or before the tenth day of July, 1895, a statement showing:

1. The number of freight cars owned by it July 1, 1895.
2. The number of such cars equipped on July 1, 1895, with grabirons, hand-holds and drawbars, in conformity with the requirements of said act of March 2, 1893.
3. The number of such cars in its own repair shops or yards on July 1, 1895, for the purpose of being so equipped with grabirons, hand-holds and drawbars.
4. The number of cars owned by other carriers, but in its possession, and in its own repair shops or yards for the purpose of being so equipped with grabirons, hand-holds and drawbars.
5. The number of cars owned by it, but in the possession of other carriers on July 1, 1895.
6. The number of cars owned by it and on its line on July 1, 1895, and the number of cars owned by other carriers, but in its possession on said date, not so equipped with grabirons, hand-holds and drawbars, nor in its repair shops or yards for the purpose of being so equipped.

Discipline of Employees.

There is no doubt that a potent initial cause of many concerted movements on the part of railroad employees to demand increased wages in the past has been the injudicious treatment accorded them by the officers above them in authority. That such treatment has often been unfair and tyrannical all railroad men know. Happily the world is growing better, and among the many improvements in human affairs the better, fairer and more judicious treatment of railroad employees is one. On well-managed roads this question has been given a great deal of thoughtful consideration, and the following remarks made by a Division Superintendent of the "Big Four" road at a recent meeting of its officers, show a most intelligent conception of the case:

"It behooves us to look nearer home for much of the cause of dissatisfaction and discontent which are the certain forerunners of trouble. Railroad men who are my seniors, and my masters in the profession, tell me that not so many years ago the grievance committee, as we understand the term to-day, was a totally unknown quantity, and why? Is it not because the growth of the employee has been out of proportion to the growth of the average official? Have not a large proportion of the official family, and I use the term in the widest geographical sense, stood still while the rank and file have progressed? Have we not been overlooking the fact that the average employee of to-day is a man of superior education to his predecessor of 20 years ago? Have we not been applying old methods to new material? Certain it is that education is the forcing bed of intelligence and intelligence begets reasoning power. Is not the modern grievance committee to a great extent the result of indiscriminating, unfair and arbitrary decisions made in the dealing out of so-called discipline for irregularities, real and technical, as well as unavoidable. Did not the officer too often go into an investigation and sit in the hight of the scorner's chair firm in the belief that he was a prosecuting attorney instead of a truth seeker? Did he not too often lose sight of the fundamental principle that in the operation and management of a railroad property the interests of official and employee are identical—that they should be in sympathy with each other and pull together? The ignoring of this principle has had disastrous effects, and it requires but little acumen to see that the corporations paid the fiddler. Decisions were given which intelligent train men knew were not sound, and who can calculate the demoralizing effect of such action regardless of whether the men escaped being disciplined when they should have been or otherwise? With the increased intelligence of trainmen came a protest against such action which the preceding generation would have accepted as a matter of course. Gentlemen, was it not for self-protection that the men banded themselves together? Is it not also true that, emboldened by their success in presenting legitimate grievances, and never being slow to perceive when they were dealing with vacillating and weak-kneed officials, they then took up, as an afterthought, such questions as callers, hostlers, constructive mileage, overtime, and, finally, the wage scale, with results which need not here be enumerated? Beware of committees, but above all beware of making committees. The prudent and intelligent officer will educate his men to the fact that he is their friend and master. He will know them, and, when necessary, will freely converse with them. He will encourage them to come to him as individuals with any legitimate grievance which may exist. He will frankly discuss such questions. He will give decided answers promptly. His no will be "No," and his yes will be "Yes." He will never indulge in the mental gymnastics known as "straddling a fence." He will fearlessly and honestly let his men know where he stands. In requiring the most absolute truthfulness on the part of his men he will faithfully accord it on his part without evasion or mental reservation. No official can maintain nor enforce discipline unless he has the respect of his force, and no one can have the real respect of his force unless by his actions he commands it."

The amusement ground of the Cotton States and International Exposition has at length been named the "Midway Heights." Despite a tendency to name it something else, the public generally took it as an accepted fact that it should be called the Midway, and it was suggested that on account of the commanding situation of the street, overlooking the Exposition grounds, it should be called Midway Heights. The name has been formally adopted, and it wil be along Midway Heights that the great crowds who attend the Fair, will find amusement and recreation.

The *Railway Age* continued its good work of issuing a daily paper at the recent conventions of Master Car Builders and Master Mechanics. This is the ninth year this valuable work has been done by this enterprising journal, and it has come to be regarded as an almost absolutely necessary feature. To those familiar with the work of printing newspapers, and with the confusing elements attending large conventions, the wonder is that this daily issue appears so regularly and with so few typographical and other kinds of errors.

The Toledo & Ohio Central Railway has departed from the usual method of employing and governing engineers and firemen. All enginemen hereafter will be employed, assigned and disciplined by the superintendents, instead of the master mechanics.

A train known as the American Special Express now makes the run from London to Liverpool, on the London & North Western Railway, in three hours and fifty minutes, and, northbound, makes close connections with the Transatlantic steamers. The train makes no stops, and its schedule time is 45 minutes less than that of other express trains between the two cities.

The number of new locomotives made available in Austria last year was estimated at 100, as compared with 138 in 1893. Of the 100 locomotives brought into use last year 10 were for lines of local interest, while 40 were required for the Austrian State lines. The whole number of locomotives at work upon Austrian lines last year was 4,218. Of the 100 additional locomotives brought into use last year, 6 were obtained from abroad, while 94 were built in Austria.—*Engineering.*

One of the most ancient industries of Great Britain is about to disappear, extinguished by foreign competition. Already in the days of the Phœnicians, prior to the Christian era, Britain was famed throughout the then known world for its copper and tin, and in Cornwall workings and likewise implements have been found which furnish conclusive proof that this metal was mined even in prehistoric times. Within the last two decades, however, the industry has shown a marked decline, especially in Cornwall, and what with the fall in the price of tin and the increasing cost of the working, owing to the great depth to which the shafts have attained, the mines have been closing down one after another, the most famous of all, the great old "Botallack," which for two centuries has been one of the sights not alone of Cornwall, but of the whole Kingdom, being now about to follow suit.

Personal.

Mr. J. E. Brown, Traveling Engineer of the Toledo & Ohio Central, has been appointed Master Mechanic at Corning, O.

Mr. Hugh G. Bowles, General Superintendent of the Monongahela River Railroad, has been appointed General Manager of that road, with headquarters at Monongah, W. Va.

Mr. G. S. Taylor, Secretary and General Manager of the New Orleans & Southern, has been appointed Receiver of the road.

Mr. J. D. Clark has been appointed Superintendent and Purchasing Agent of the Mobile & Birmingham, with office at Mobile, Ala.

Mr. H. M. Aiken has been appointed General Manager of the Morristown & Cumberland Gap, with headquarters at Morristown, Tenn.

Mr. W. E. Williams has been appointed Purchasing Agent and storekeeper of the International & Great Northern, with headquarters at Palestine, Tex.

Mr. Johns Hopkins, Vice-President of the Huntingdon & Broad Top Mountain Railroad, died at his residence in Philadelphia, Pa., June 7, aged 36 years.

Prof. W. F. M. Goss, of Purdue University, was elected an associate member of the American Railway Master Mechanics' Association at its last convention.

Mr. Richard Fitzsimmons has been appointed Acting Master Mechanic of the Mexican National at Santiago, Mex., to succeed Mr. Robert Dewar, resigned.

Mr. S. A. Hodgman, of the Lobdell Car Wheel Co., of Wilmington, Del., was elected an honorary member of the American Railway Master Mechanics' Association at its recent convention in June.

Mr. M. Wakefield has been appointed Mechanical Superintendent of the United Counties Railway, with headquarters at St. Hyacinthe, Quebec, succeeding Mr. F. Carr, Master Car Builder, resigned.

Mr. G. W. Vaughn, Vice-President and General Manager of the Santa Fe, Prescott & Phœnix, has resigned, and the duties of the office will be performed by Mr. F. M. Murphy, president, whose headquarters are in Chicago.

Mr. James Maglenn has been reinstated as Superintendent of Motive Power and Machinery of the Seaboard Air Line, succeeding Mr. William T. Reed, resigned. It has been but a few months since Mr. Maglenn resigned the above position and was succeeded by Mr. Reed.

The Atchison, Topeka & Santa Fe has abolished the office of Superintendent of the Western Division, which was held by Mr. T. H. Sears, and the jurisdiction of that office has been transferred to Mr. Charles Dyer, General Superintendent of the Western Grand Division.

Mr. Frank Pease, formerly General Foreman of the machine shops of the Chicago & West Michigan at Muskegon, Mich., has been appointed Superintendent of Motive Power of the Toledo, St. Louis & Kansas City, with headquarters at Frankfort, Ind., to succeed Mr. C. E. Walker, resigned.

Mr. F. Huffsmith, Master Mechanic of the International & Great Northern, has had his jurisdiction extended over the car department of the same road. This displaces Mr. W. P. Siddons, who has been superintendent of the car department of that road for the past eight years. It is said that Mr. Siddons has been tendered a similar position on a western road.

Several changes in the Transportation Department of the Pennsylvania Railroad have been made. Mr. E. F. Brooks, Superintendent of the Maryland Division of the Philadelphia, Wilminaton & Baltimore, has been appointed to the Superintendency of the New York Division, to succeed Mr. Joseph Crawford, who, on account of illness, has been granted an indefinite leave of absence. Mr. William N. Bannard, Superintendent of the Altoona Division, succeeds Mr. Brooks as Superintendent of the Maryland Division, and Mr. Robert E. Marshall, Superintendent of Motive Power of the Philadelphia, Wilmington & Baltimore road has been made Superintendent of the Altoona Division. Mr. Clarence Mendenhall, Assistant Engineer Motive Power of the New York Division, succeeds Mr. Marshall.

The French Minister of Public Works recently adopted regulations concerning the forms to be observed by the railroad employés of that country during the passing of a Presidential train. They must abstain from crying out, as usual, the names of the stations; the service must be performed with an absolute silence, and orders are to be given only by whistling. The employés of all grades, when the Presidential train is in sight, and on its passing along the tracks or by the stations, must uncover and remain bareheaded during the train's stop. There is more tomfoolery about these orders than we thought a French public officer could be guilty of.

New Locomotive for the Cross Creek Coal Co.

The engraving appearing below is produced from a photograph kindly sent us by Mr. Reuben Wells, Supt. of the Rogers Locomotive Co., of Paterson, N. J., and shows the general appearance of a small locomotive recently built by this company for the Cross Creek Coal Company, of Drifton, Pa. An engine similar to this one was built about the same time for the same company, and both are reported as working very satisfactorily in every respect.

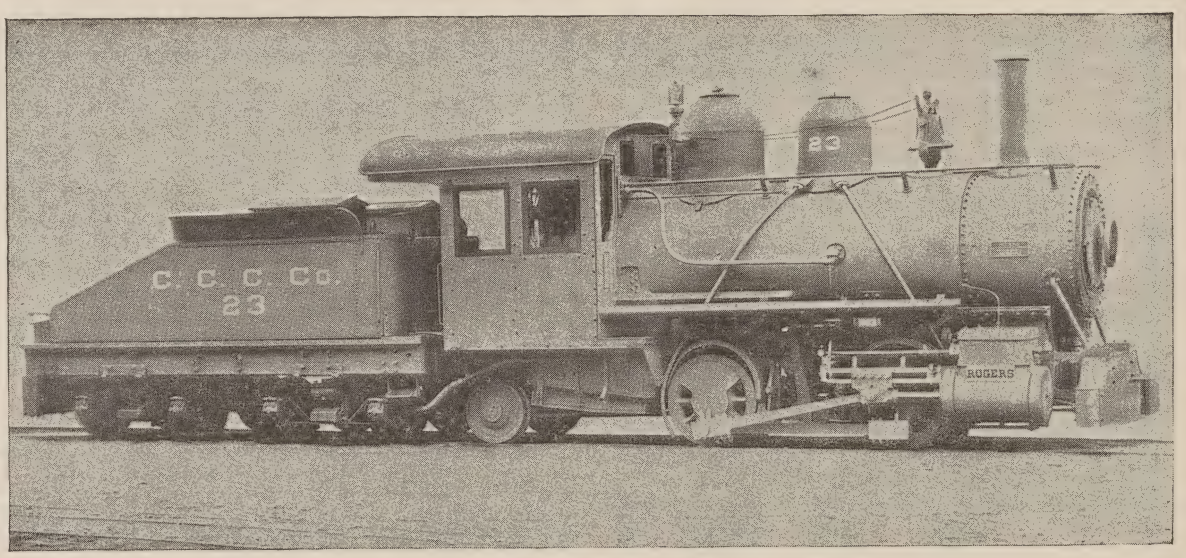
The engines are made for a 4-foot ½-inch gage of track, and, as will be noted, have some rather unusual features of construction. The narrow gage of track made it necessary to have a wider firebox than the usual arrangement of driving wheels will allow, so the firebox is placed behind the back drivers, and is about six inches wider outside then the gage of the track. A heavy cross plate with angle pieces at the front of the firebox joins the part of the frame front at that point to the steel slab part back of that.

The truck is of the radial pattern, and the pin of the radius bar is located about six inches back of the driving axle, the forked radius bar passing under the ash pan. The weight on the truck is carried on two hangers 20 inches long. The lower hanger pin is located below the axle, and the upper one at the top of the spring band. The spring is transverse, its ends resting on the journal boxes. The weight on the truck is intended to be only about enough to steady the engine, to prevent "pitching," as it would do if it had no truck. The length of the suspension links permits of the truck adapting itself to curves of 100 feet radius, or even less, without bringing much lateral force on the drivers; and they, therefore, follow the curve practically about as they would without the truck. Many of the curves where the engines are at work are not more than 100 feet radius, some even less than that, and the grades are from one to two and one-half per cent.

The engine is equipped with the steam-applied brake to the drivers; the buffing blocks at either end, and drawbars are placed 15 inches above the rails to their centers. The cab is of steel, No. 10 thick, with angle iron corner pieces and roof carlins.

The engine is designed to burn anthracite coal and weighs 64,000 pounds, 56,000 pounds of which rest on the drivers, and 8,000 on the trailing wheels.

The total wheel base of the engine is 13 feet 8 inches, the driving-wheel base being 6 feet and the total of engine and tender 29 feet 10 inches. The grate area is 15.2 square feet. The total heating surface is 894 square feet, of which 820 are furnished by the tubes and 74 by the firebox.



Narrow-Gage Locomotive with Wide Firebox

All the axles are made of hammered iron, the journals of the driving axles being 7½ by 9 inches, and of the truck axle 5 by 12 inches. The drivers are 36 inches in diameter, and the trailing and tender truck wheels are 26 inches in diameter and are made of chilled cast-iron. The cylinders are 14 by 20 inches and have Richardson balanced axles. The piston rods are 2½ inches in diameter and have metallic packing in the stuffing-boxes. A single exhaust pipe is used.

A straight boiler is used and carries 175 pounds pressure. It is made of steel and has crown bars, and contains 159 iron tubes 2 inches in diameter and 9 feet 11 inches long. The firebox has a brick arch and stationary grates, with a drop plate. The tank holds three tons of coal and 1,600 gallons of water. Its frame is made of white oak and it is mounted on diamond trucks.

Main rod, length center to center	5 ft. 6½ in.
Steam ports, length	12½ in.
" " width	1¼ in.
Exhaust ports, length	12½ in.
" " width	2½ in.
Bridge, width	1¼ in.
Valves, greatest travel	4½ in.
" outside lap	1/16 in.
" inside lap or clearance	— in.
" lead in full gear	1/16 in.
Boiler, thickness of material in barrel	7/16 in.
" diameter of barrel outside at first course	52 in.
Seams, kind of horizontal	quadruple riveted butt.
" " circumferential	double riveted lap.
Dome, diameter	28 in.
Firebox, length	4 ft. 0 in.
" width	3 ft. 9¾ in.
" depth, front	5 ft. 0 in.
" " back	4 ft. 6 in.
" thickness of sheets, sides and back	5/16 in.
Crown sheet, thickness of	⅜ in.
Flue " " "	½ in.

The Flight of Birds.

The following particulars respecting the flight of birds will no doubt prove of interest to those interested in the subject of aerial flight: Hawks, says Fleming, in his Philosophy of Zoology, probably fly at the rate of 150 miles an hour, and an eider duck at 90 miles. Sir George Cayley estimates that the common crow flies at nearly 25 miles an hour. Spallanzani found the rate of the swallow to be 92 miles an hour; while he conjectures the velocity of the swift to be nearly three times greater. A falcon that belonged to Henri IV., of France, escaped from Fontainebleau, and in 24 hours afterward was found at Malta, a distance of not less than 1,530 miles; a velocity equal to nearly 57 miles an hour, supposing the bird to have been unceasingly on the wing. But, since such birds never fly by night, and allowing the day to be at the longest, its flight, was, perhaps, equal to 75 miles an hour. If we even restrict the migratory flight of birds to 50 miles an hour, how easily can they perform their most extensive migrations. Fair winds may, perhaps, aid them at the rate of 30 or 40 miles an hour, or even help them attain three times greater rapidity.—*The Practical Engineer.*

Welding Rails.

Success is attending the production of continuous rails for street railway tracks. In St. Louis the method is pursued of uniting the rail ends by merely running a casting of iron around the joint by means of a special mold, and these are heaped up near the line of the track and a fire built around them, so that by the time they are to be put around the joints they are a dull red. The iron is poured into the molds from a ladle, as in ordinary foundry practice. After the iron has been poured the molds are allowed to remain about ten minutes before being taken off and used at a second joint; every other section of a track is cast in the morning, and in the afternoon the remaining joints are made, this being done to prevent as far as possible the severe strain of contraction and expansion, for when the joint is hot it heats the rail for some distance on each side, and consequently there is considerable expansion.

Where it is possible for a road to make connections with Niagara Falls steps are being taken to that end. The coming commercial importance of the city when the water power company begins operations is being discounted by the transportation lines.

Travel of the World's Transportation Commission.

Mr. Clement F. Street, of the Field Transportation Commission, which is now making a tour of the world, writes from Ceylon to the *Railway Review* in regard to the government railway there. He says:

"The rolling stock of the line has been undergoing some radical changes in the way of abandoning the English type of four and six-wheeled carriages and adopting the American bogie. The change has passed the experimental stage and all new cars have bogie trucks. All grades on the line are marked with a sign so the engineer or anyone passing over the line can by watching for these signs tell the grade at a glance. The signboard is about 4 inches wide and 2 feet long, with one end nailed to a post about 3 feet high. The board is deflected to correspond with the direction of the grade. A level is indicated by printing the word 'level on the board and placing it in a horizontal position. The stations along the line are, with only five exceptions, of either stone or brick, and all are good substantial buildings.

"The locomotive drivers are mostly Europeans, but some natives or East Indians are employed for handling goods trains. New men start in at 150 rupees (about $37.50) per month and can make about $10 per month coal premium. They work by the day, eight hours being called a full day, and all over that commands an extra rate as overtime. The coal used all comes from England and costs about $5 per ton.'

A new through sleeping-car line from New York to Chattanooga, has been started over the Southern Railway, going through the picturesque mountains of Western North Carolina. The through car leaves New York by way of the Pennsylvania Railroad at 4:30 p. m., leaves Washington by the Southern Railway 10:43 p. m., arriving in Chattanooga the following evening at 6:40.

Master Car Builders' Convention.

(*Continued from page* 105.)

Passenger Car Ends and Platforms.

companies and by others to strengthen car platforms and ends so as to resist violent shocks, and it has made some preliminary drawings in the effort to put before you something definite for your consideration. It feels, however, after due consideration and discussion, that nothing complete can be presented yet to cover the many conditions of the problem, and has been led to this conclusion by several facts.

The National Government has lately required that the ends and frames of postal cars used by the railroads to transport the United States mails shall be strengthened and provided with vestibules, and it has issued instructions describing to some extent how this shall be done. Some of the railroad companies are now constructing cars in which they have endeavored to meet these requirements, and others of us are debating the advisability of entirely doing away with the platform on all kinds of passenger train equipment cars that do not require accommodations at their ends for the entrance and exit of passengers, or at least of making only a very small one on them by extending the main floor framing a short distance beyond the end of the car body. Many improvements are being worked out in other directions also; iron or steel of various forms is finding a place in the framing at the ends of passenger cars, the fastening of the usual platform to the car body and the attachment of the coupler are both undergoing changes in recent practice, with a view of giving greater strength to the one and more flexibility to the other; different forms of vestibules are also being tried. And none of these plans has yet advanced entirely beyond the experimental stages. Further, the large individual car builders and coupler manufacturers are actively engaged in developing their ideas in the same direction, and thus there are features the association would have to avoid as well as those it must prove by actual test.

Therefore, while it is very desirable that the association should take some action in the matter, your committee deems it unwise, and indeed impracticable because of the reasons given, to do more at the present time than report progress, and to ask to be continued, if it pleases the association, believing that developments in the work done will take place in a short time, which will point conclusively to something definite for recommended practice in strengthening passenger car ends and platforms. And in order that this belief may be realized to its fullest extent it is hoped that the members of the association will be stimulated to renewed interest in the subject, and that they will push everything in the nature of investigation to a conclusion.

E. W. GRIEVES, C. A. SCHROYER, T. A. BISSELL, SAM'L PORCHER, M. M. MARTIN, J. J. HENNESSEY.

Mr. Waitt moved that the report be received and the committee continued. Carried.

Mr. Adams: Some plans given us by the United States Government showed the heater on one platform and the washstand on the other; showing that while they are willing to pay for a sixty-foot car they want to occupy five feet on the platform, and have it enclosed by a vestibule, which they do not seem willing to pay for.

Mr. Rhodes: The government has taken up the question of car construction, and they are asking some of the railroads in building their cars according to those specifications. Some roads object to that. We built some cars according to these specifications; there is a clause in these specifications that wherever the railroad company wishes to construct the cars on its own specification it has that privilege, provided it shows its construction is better. One specification shows a plan as Mr. Adams has stated; heater located at one end and the saloon arrangements at the other end on the platform. We were going around the shops of the company at St. Louis one day, and the foreman in advocating the strength that there was in these cars, showed us one which had been in collision, and both the platforms, with the heater and saloon arrangements, had been crushed in like an accordion. I remarked to the officials, "If your post-office clerks had been washing their hands at this time, or if any of the company's men had been firing up the heater, you would have had an unfortunate experience." I venture to say that there will be very few cars built that way.

Mr. Grieves: I have seen such cars; they have the platform on the main frame of the car, with the stove and other arrangements on the platform. It is a new style of vestibule, with the end of the car cut away, so as to utilize the platforms as part of the car body. We are building five postal cars, where the platforms are only twelve inches from the end of the car, and formed by the main frame of the car.

Mr. Adams: I agree in the matter in regard to building baggage and express cars without platforms; it is absurd. I object to increasing the weight of our cars. It is certainly a large expense to haul an extra amount of tonnage over the road. I have studied the thing and you can see it amounts to a great deal of money; and if you increase it two or three tons it will amount to a large sum in the life-time of a car.

The report of the Committee on Coal Car Sides was read by Mr. Higgins.

Coal Car Sides.

Your committee has carefully considered the methods of staying the sides of 60,000 lbs. capacity coal cars with high sides, and is of the opinion that the most economical and efficient method of staying the sides of these cars is by the use of a transverse tie rod, near the top, protected by angle iron, as shown in Fig. 1.

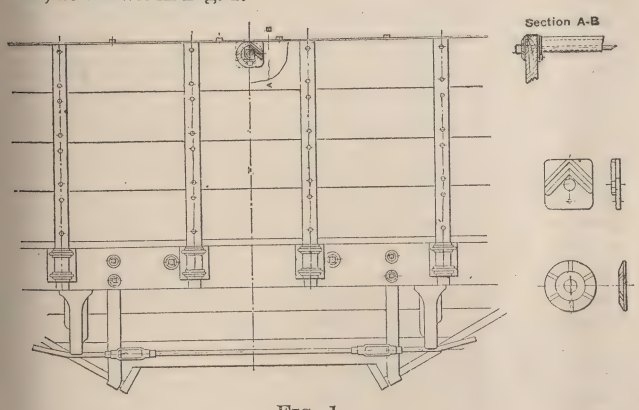


FIG. 1.

When, however, this construction is prohibited, on account of cars being used at times to carry lumber and other lading with which this cross member would interfere, your committee would recommend extending two stakes on each side and near the middle of the car, below the side sills and supporting them by castings having a bearing against the sides of the hopper-bottoms, as shown in Fig. 2, or some equivalent construction.

In connection with this latter arrangement, it is desired to call attention to the fact that when the car is loaded, the weight of the loading in the hopper-bottom will assist in keeping these castings out to their proper position.

Your committee would further recommend that stakes may be made as deep as practicable, and that they be spaced closer together near the middle than toward the ends of the car; also, that stake pockets be put on with a little draw, when the stakes are new, so that they can be tightened o follow up the shrinkage of the stakes.

Several devices for staying the sides of these cars have

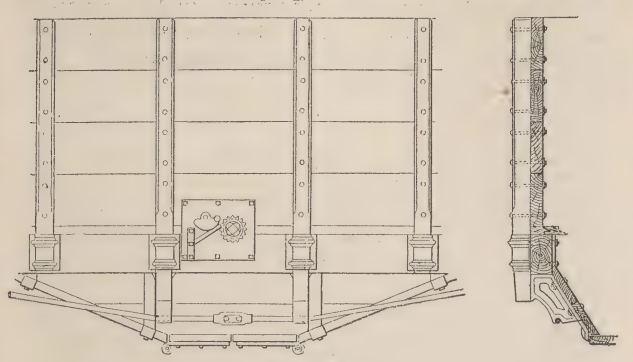


FIG. 2.

been patented, some of which have been used on a large number of cars and possess more or less merit, but your committee has failed to discover that any of them are superior to the two methods above mentioned.

R. E. MARSHALL, R. C. BLACKALL, G. W. WEST, SAM'L HIGGINS, ROBERT MCKENNA, LA MOTT AMES, R. P. C. SANDERSON.

Mr. Barr moved that the report of the committee be received and the committee discharged. Carried.

Mr. Mitchell: I do not think recommendation No. 2 is going to be effective. The method not shown here is far superior to either one shown; and that is, having truss rods go up the sides, to a point about half a foot below the top.

Mr. Higgins: The committee received a number of blue prints from some of the most prominent roads in the West that have been using the method of supporting the stakes by running them down and butting them up against the cross-tie timbers; and claim that has given good results; but this arrangement, we learn, was probably a patented device, and we therefore deviated from it and recommended that the castings be placed on the side of the hopper. I do not agree with Mr. Mitchell as to the truss rods, from personal observation, as there are objections to that arrangement, in that if you place the truss rod high enough, you are liable to interfere with the clearance. That would be the trouble on our road. We have got to resort to the transverse rod.

Mr. Grieves: The construction shown here would work all right for the hopper of the gondola car, but not an ordinary coal car as known in the West. After we had about 5,000 cars built with the two center stakes above the cross-tie timbers, and extending over the tie timbers, we heard that this method was an infringement of a patent, but subsequently learned that it had been used by some road in the Northwest before the date of the patent, and we are now using this construction when we alter our old cars; it holds up the sides and prevents them from bulging out. Our cars are from 36 to 40 inches high—34-foot car. We have had good results from that practice.

Mr. Morris: We use on our line 4,000 hopper bottom cars, and our last cars are 60 inches high. We used the slide truss for a good many years. We found that it was not what it should be, and we have adopted the transverse rod, which answers the purpose admirably.

Mr. Mitchell: We had a good many cars where the sideboards overlapped the end boards. We changed our construction as the cars went in the shop, so that the end boards overlap the side boards, and then put the corner casting in so that the projection went through the end board; and we have had no springing whatever of the end boards. We have a car that has been running two years, 50 inches high, 34 feet long, with a side truss. I saw the car the other day and the sides are absolutely straight.

Mr. Sanderson: The Norfolk & Western used the side truss rods a long while on deep hoppers and found them unsatisfactory. Empty the cars would look all right, but loaded they would bulge. We found it impracticable to keep the side truss up in proper shape. We now use on all deep hoppers one or two cross braces, made out of oak, and strapped on the top with iron bars.

Mounting New and Second-hand Wheels.

The committee appointed to report on "best method of mounting new and second-hand wheels," begs to report as follows:

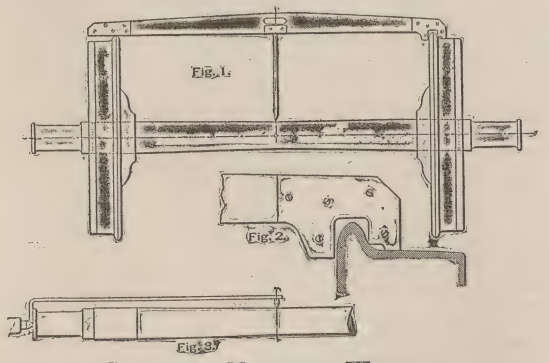
First. It recommends that a gage for determining the center of the axle, as shown in Fig. 3, be used, and that all axles be centered prior to mounting.

Second. That a gauge, as shown in Fig. 1, be used for locating the first wheel, mounted properly with reference to the center of axle.

In the drawings presented, Fig. 2 gives a view of the end of the gage, which is drawn to the same lines as the flange gage adopted by the Master Car Builders' Association.

Third. In mounting second-hand wheels, the committee recommends that if flanges are worn to not less than 1¼ inches in thickness, they shall be mounted as new wheels.

If the flanges are worn to less than 1¼ inches in thickness they shall be mounted so that the gage between flanges measures 4 feet 5½ inches, instead of the standard, 4 feet 5⅜ inches.



GAGES FOR MOUNTING WHEELS.

It is the opinion of the committee that all practical results will be obtained in mounting second-hand wheels in this way, and that an attempt to work closer than this would simply result in an elaboration of precaution and measurements that would never be carried out. The committee also recommends that wheels with flanges worn to a thickness of 1⅛ inches should not be mounted. It is thought, in view of the previous report which was made on the subject of mounting wheels, that it is unnecessary to go any further into detail on this subject.

Your committee, in presenting the above, has based its conclusions entirely on cast-iron wheels. As steel-tired wheels enter the question to quite an important extent, and as steel flanges are not as liable as cast-iron flanges to break off, this committee recommends (Mr. McConnell excepted) that the limit of thickness of flange of steel-tired wheels be made ⅞ inch instead of 1 inch, the present limit for cast-iron wheels, and that wheels with flanges less than 1 inch be re-mounted so that the gage between flanges measures 4 feet 5¾ inches, instead of 4 feet 5⅜ inches.

J. N. BARR, T. J. HATSWELL, THOS. SUTHERLAND, G. L. POTTER, JNO. HODGE, WM. FORSYTH, J. H. MCCONNELL.

Mr. Marshall moved that the gages recommended in the first and second paragraphs of this report be submitted to letter ballot for adoption as recommended practice. (Carried.)

Mr. Waitt called attention to the fact that the check gage shown in Fig. 2 of the report, while applicable to new wheels properly is not so to old wheels with worn flanges, and recommended that the matter be referred to a committee for consideration. The apparent defect of the gage is that it will admit wheels with flanges worn out to 4.6$\frac{11}{16}$ inches instead of 4.6¾, the adopted standard.

Mr. Barnes: This seems to be a small difference of measurement. When a load comes on the axles, they spring enough to bring the wheels a quarter of an inch nearer together. The variation of the spring of the axles and the shortening distance between the wheels is of much more importance than the slight difference in the measurements of the shape of this gage.

Mr. Barr: The practical side of this does not amount to much; but we do not want to say something is right, unless it is. I feel like endorsing Mr. Waitt's idea that the committee should take hold of this matter and see that everything is right. I have not used the gage at interchange points. The gage does not allow any limit between the inside limit of one flange and the outside limit of the other. That is the practical thing that is wrong with the gage. I am aware of it; but it is not liable to make any special difficulty.

Mr. Mitchell moved that the matter be referred to the committee in conference with the American Railway Association. (Carried.)

Mr. Waitt: There is another point in connection with this subject. We adopt a check gage 4 feet 6¾ inches. We also have a standard on our books of distance between wheels for mounting, 4 feet 5⅜ inches. We also adopt a standard for flanges of new wheels, the maximum being $\frac{17}{16}$ inches. If you will add $\frac{1}{16}$ inches to 4 feet 5⅜ inches you will find that under our standards for mounting wheels we get a whee that will not pass our check gages. Our standards are inconsistent by one-sixteenth of an inch. The report of the committee has recommended a practice in mounting the wheels that every one will object to, having three different distances between flanges for mounting wheels, according as they are new, worn slightly, or worn a good deal. It is a fact that if you mount all of your wheels 4 feet 5¼ inches between the flanges—some favor three-sixteenths, but the one-sixteenth does not interfere with any of our standards—you will never, under any circumstances, have any impingement on the frog; you will keep within the 4 feet 6¾ inches gage. It seems to me that this matter of making our wheel gages consistent with each other ought to have more practical consideration by the gentlemen who are members of this association. I move that the matter in regard to wheel gages be referred back to the committee for further consideration and report another year.

Mr. Barr: These are, of course, standard size for flanges, but when you come to use the gage with wheels having thick flanges up to the limit allowed you get into trouble: The committee understood these points very well, but it decided that it was not going to touch them. This committee is on remounting second-hand wheels, and we tried to keep to the subject.

Mr. Waitt: I move that this matter be referred to such committee as the executive committee may select, to report at the next meeting. (Carried.)

A report of the Committe on Wheel Gages appointed to confer with the American Railway Association was called for.

Mr. Barr: A conference was held with a committee of the American Railway Association, and further action was deferred by mutual consent until the Pennsylvania road made their experiments on the relative merits of the 4 feet 9 inches, or 4 feet 8½ inches on the present gage of wheels.

The Executive Committee recommended that the standard size of postal cards be changed from 3½ by 5½ inches to 3¾ by 6½ inches, to conform to the new style adopted by the United States Government.

On motion of Mr. Adams the change was adopted.

Mr. Adams moved that article I. of the By-Laws be changed so that the regular meeting shall be held on the second Wednesday in June instead of the second Tuesday in June. Carried.

On motion of Mr. Waitt, the Secretary was instructed to cast the ballot of the association for the following officers: President, John S. Lentz; First Vice-President, S. A. Crone; Second Vice-President, E. D. Bronner: Third Vice-President, J. C. Barber; Treasurer, G. W. Demarest. New members of the Executive Committee, R. H. Soule, H. S. Hayward, A. E. Mitchell.

Mr. Barr suggested that the members consider the advisability of changing the date of meeting to some time in the fall, when the meetings might be held in the large cities of the country.

Of the places named for holding the next Convention Niagara Falls was most favored.

"Nome, I would like to saw the wood, but it is agin my principles." "Well," said the hard-faced lady, "it is just this way: If you won't swallow your principles you don't swallow any pie."

An Irishman had to appear in court as a witness. "What did you do, Pat?" asked a friend afterward. "They says 'Swear!' an' I says '——,' and begorra, they turned me out!"

"Popper," asked little Ikey Ficklestein, "vat does this book mean by he 'took only a languid interest?'"

"Any inderesdt undter dree per sendt a mondt was lankvid," explained the fond father. "In fagdt, you mighdt call it apsoloodely sicgkly."

The City Council of Joliet, Ill., has adopted a resolution declaring that the only official, correct and proper pronunciation and spelling of the name of that city shall be Jo-li-et, the accent on the first syllable, with the o in such first syllable pronounced in its long sound, as in the words so, no and foe.

Communications.

Rebuilt Locomotives.

Editor National Car and Locomotive Builder:

Referring to my contribution in your June issue on rebuilt locomotives I notice an error under the skeleton of the rebuilt engine. You state that the rebuilt engine ha 18 by 24 cylinders, replacing engines with the same cylin ders. If you will refer to the previous article, you will see how this disagrees with the whole principal of the engine I stated that the new or "Rebuilt" engine had 17 by 24 inch cylinders, but that, with the increased boiler provision and pressure, the new engine with 17-inch cylinders, in spite of its increased weight, is doing better work in every way than the old engines with an inch larger cyl inders.

I also note in the elevation drawing of the rebuilt engine, that you show the motion or spectacle plate ½ inch thick. This should be 1½ inches thick.

Yours faithfully,

FRANCIS R. F. BROWN,

Mechanical Superintendent Intercolonial Railway of Canada.

Poultry Transportation Cars.

Editor National Car and Locomotive Builder:

I notice an article in your June issue which does us great injustice. In the first place we are not shippers of poultry; we merely rent the cars to the shippers, and, in the next place, air-brakes have nothing to do with cruelty to the stock or overcrowding. Also, our cars are never overloaded in the way that coops on common cars are, and we provide ample facilities for feeding and watering the stock and the convenience of the attendant. In regard to vertical plane couplers, I beg to advise that there are a great many different kinds on the market, and the law allows us some time yet to put these appliances on, which will furnish sufficient opportunity for us to get the best, which we intend doing.

FRANK X. MUDD,

General Manager Live Poultry Transportation Company.

CHICAGO, Ill., June 18.

[In reference to the above, we have only to say that the information furnished this journal was to the effect that 4,000 or 5,000 head of poultry are usually carried in these cars, which are about 34 feet long. We are not prepared to say just how many head of poultry cars of this size are capable of accommodating without overcrowding, but the statement that 4,000 or 5,000 head are carried recalls scenes we have witnessed of such overcrowded conditions of poultry in transit as must necessarily have been exceedingly cruel to the fowls and inimical to the public health-as poultry thus transported is generally shortly consumed as food. In the transportation of live stock the modern improvements of car construction, of which air-brakes and vertical plane couplers are the chief, have been found to be of great service in mitigating the hardships of travel and the resulting injury to the animals, and it is hardly a debatable question that the same holds good of poultry transportation.—EDITOR.]

Hose for Steam Heating Equipment.

During a discussion on car heating at the May meeting of the Western Railway Club, Mr. George Gibbs called attention to the expense of maintaining the hose connections between the different parts of trains heated by steam. He said:

"The question of rubber hose for steam heating constitutes a more important one than most people think at first sight. We have been trying to keep a record of the life of our hose and have done so on the engine hose; that is, hose between the engine and tender and tender and first car, aud apparently we find that one-fourth of the hose in use lasts 30 days, that is, where the engine hauls the train using electric light occasionally, possibly twice a week. In using electric light we have to supply 100 pounds steam pressure. At other times the pressure is less, and the usual average life of hose is 45 days. In trains using only steam heating pressure, 20 to 50 pounds, the engine hose lasts about four months; back in the train between cars where the pressure is less, the life is about one season. This is only obtained with the very best hose in the market, and we have found the highest priced hose to be the best and most economical in the end. The life, you see, is very short, and we have taken special pains to increase it by making very solid fastenings from the hose to the shank; where the fastening is not solid, the life is much less. As hose costs between three and four dollars apiece, it will be seen that this expense is quite an item."

The progress of the competition between the railroads and canals in New York State is illustrated by the fact that up close to the opening date of the canals this year, there was not a single boat loaded with grain in the vicinity of Buffalo. In former years at this time an average of 100 boats had cargoes and were impatiently awaiting the word to start. This condition of things is said to be due to the fact that the boat owners want three cents a bushel, and cannot afford to carry the grain for less, while the railroads are said to be carrying it for 2⅜ cents. During the first three weeks of May only 260 boats cleared from Buffalo for the east, compared with 445 in the same period last year.

The Master Mechanics' Convention.

The twenty-eighth annual convention of the American Railway Master Mechanics' Association was opened at Alexandria Bay, N Y., with President Garstang presiding. The following members attended:

Aiken, C. L.
Aldcorn, Thos.
Allen, G. S., P. & R.
Ames, L., Beech Creek.
Arp, W. C., R. C. C. & St. L.
Atkinson, R., Canadian Pacific.

Baker, George H., National Car and Locomotive Builder.
Barnes, D. L., Railroad Gazette.
Bartlett, Henry.
Been, John, C. C. & S.
Beltz, A. J., D. S. & S.
Bisset, John, W. W. C. & A.
Blackall, R. C., D. & Hudson.
Blackwell, Chas., Mount Lookout.
Bradley, W. F., T. A. A. & N. M.
Briggs, R. H., K. C. M. & B.
Brown, David, D. L. & W.
Bryan, J. T.
Bushnell, R. W., B. C. R. & N.

Campbell, John, Lehigh Valley.
Chambers, John S., Illinois Central.
Childs, H. A., N. Y., L. E. & W.
Clark, Bernard, N. Y., L. E. & W.
Clark, Isaac W., C. F. & Y. V.
Cleaver, F., Vandalia.
Collinson, Jas., A., T. & S. F.
Cooper, Chas. J., T. & O. C.
Cromwell, A. J., B. & O.
Crossman, W. D.

Davis, E. E., Phil. & Reading.
Davis, W. J., Pitts. & Western.
Dehn, F. H. Texas Central.
DeWitt, Chas. H., Lehigh Valley.
Divine, J. F.
Dixon, W. F.
Dorsey, J. B., Ohio River.
Drury, M. J., A., T. & S. F.

Ellis, J. J., C., St. P., M. & O.
Ennis, W. C., F. Y. S. & W.

Forsyth, Wm., C., B. & Q.
Foster, W. A., Fall Brook Coal Company.
Fuller, C. E., Central Vermont.

Galbraith, R. M., St. L., A. & Tex.
Garrison, P. E., West Shore.
Garstang, Wm., C., C., C. & St. L.
Gentry, T. W.
Gibbs, Geo., C., M. & St. P.
Gordon, J. T., Concord & Montreal.
Goss, W. F. M., Purdue University.

Hainen, J., N Y., L. E. & W.
Harris, Geo. B., Georgia Southern.
Haskell, B., C. & W. M.
Hatswell, T. J., T. & P. M.
Hawksworth, D., Bur. & Mo. R.
Heck, P. H., C., W., I. & B.
Herr, E. M., Chic. & N. W.
Hibbard, H Wade.
Higgins, S., Lehigh Valley.
Hill, J. A., Locomotive Engineering.
Hill, Rufus, Pennsylvania.
Hincley, A. C, St. Jo. & Gd. Island.
Holman, W. L.
Hudson, E. E., C., C., C. & St. L.

Joughins, G. R., Norfolk Southern.

Kissler, Lewis, D., L. & W.

Lauer, T. G., Buff., Roch. & Pitts.
Lawler, F. M, C., C., C. & St. L.
Lawes, T. A., C., C., C. & St. L.
Leach, H. L.
Lee, C. W., Southern.
Leeds, Pulaski, L. & N.
Leeds, J. H.
Lewis, W. H., C., B. & N.

MacKenzie, John, N. Y., C. & St. L.
Manchester, A. E., C., M. & St. P.
Manning, J. H., Union Pacific.
Marshall, W. H., Railway Master Mechanic.
McConnell, J. H., Union Pacific.
McKee, G. S., C., C., C. & St. L.
McKenna, John, L., D. & S. W.
Medway, John, Fitchburg.
Millen, Thos.
Miller, Geo. A., J., St. A. & H.
Mills, Statt., Lehigh & Hudson.
Minshull, P. H., N. Y., O & W.
Mitchell, A. E., N. Y., L. E. & W.
Moore, J. H., N. Y., L E. & W.

Neuffer, John G., B., O. & S. W.
Nettleton, W. A., K. C., Ft. S. & M.
Noble, L. C.

Owens, W. H., So. Ry.
Pattee, J. O., Great Northern.
Pomeroy, L R.
Redding, Robert B., N. Y. Elevated.
Rettew, E., D. & Hudson.
Riley, G. M. D.
Riley, Geo. N.
Roberts, M., St. L., I. M. & S.
Robinson, Frank.
Ryan, E., G. H. & S. A.
Setchel, J. H., Pittsburgh Locomotive Works.
Sinclair, Angus, Locomotive Engineering.
Smith, J. Y.
Smith, W. A.
Smith, Geo. W., A., T. & S. F.
Smith, H. C., D. & Hudson.
Smith, W. T., N. N. & M. V.
Soule, R. H., N. & W.
Sprague, H. N.
Sprigg, Z. T.
Steel, S. A., W. & Pitts.
Stewart, A. F., C. & O.
Stewart, O.
Stone, W. A., Southern Ry.
Stubb, W. H., Cent. R. R. of Ga.
Sutherland, R. D., B., R. B. & L.
Swanton, Wm., C. S. T. L. & P.
Taylor, H. D.
Thatcher, Thos., D., L. & W.
Thomas, W. H., Southern Ry.
Thompson, John.
Todd, Louis C., B. & M.
Tonge, John, M. & St. L.
Turner, C. G., P., W. & B.
Turner, C. E., W. N. Y. & P.
Turner, J. S., W. Va. Cent. & Pitts.
Tyrrell, T. H., S. I. R. T.
Vauclain, S. M., Baldwin Locomotive Works.
Waitt, A. M., L. S. & M. S
Watts, Amos H., C. J. & M.
Weaver, Jas. N., Lehigh Valley.
Wheelock, Jerome.
Wiggin, Chas. H., B. & M.
Wightman, D. A., Pittsburgh Locomotive Works.
Williams, E. A., M., St. P. & S. Ste. M.

President Garstang's Address.

In the course of his address Mr. Garstang spoke of the A. R. U. strike of a year ago and expressed an opinion that the problem of winning the confidence and esteem of employees, and thus securing their loyalty to the interests they serve, is of greatest importance; and suggested that the profit-sharing plan and the pensioning of old and disabled employees might prove a cure for the evils of strikes. He recommended that encouragement be given members of the Traveling Engineers' Association, Master Car and Locomotive Painters' Association and Association of Railroad Air Brakemen. Continuing he said:

When we last met we were in the midst of a general business depression. Upon every hand the earnings were decreased to such an extent that it became almost a question of existence of many roads, but to-day the railways show flattering prospects, and as a natural result they are increasing locomotive and car equipments. The railway is a most sensitive barometer of business. It is the first to feel a general depression, however slight, and the first to indicate a resumption of business. It is to be hoped the indications will prove of a permanent nature.

The speed of through passenger trains on nearly all the trunk lines has been scheduled to 40 or 45 miles per hour. To meet these conditions it has been found necessary to construct new locomotives. It is about the design and construction of these that I would call your particular attention. In the designing and construction of high speed locomotives, the most desirable features are: large boiler capacity with heating and grate surface in due proportion; large driving wheels; light reciprocating parts and large bearing surfaces for the journals. As the limit of speed and power depends on the capacity of the boiler to furnish steam, it seems of vital importance that the heating surface be as large as the weight will allow, and the grate surface of sufficient area to permit of a fairly slow and consequently economical rate of combustion. The type of boiler best adapted to meet the requirements mentioned seems to be the "radial stay wagon top," because of its large water capacity and steam room, and its lighter weight for a given amount of heating and grate surface as compared with other types of boilers.

The use of steel instead of cast iron for large driving wheels has increased during the past year with the result that the weight saved, by making them of steel, has been used to increase the size of boiler, thereby getting a boiler with increased capacity and with no additional weight on the track. There seems to be a gradual drift of opinion in favor of large driving wheels for fast passenger engines With a large wheel the piston speed is moderated and the result is a better distribution of steam and less wear on frictional parts than can be secured with smaller wheels The year past has seen the advent of a number of fast passenger locomotives of the eight-wheel type with 20 by 24-inch cylinders carrying 190 pounds steam pressure and not exceeding 125,000 pounds in weight. These are giving excellent results. With this construction the ratio of adhesion to tractive power is less than four, the figure recommended by this association. When under speed the adhesion is ample for the maximum tractive power developed. In starting the sand blast overcomes any serious trouble from slipping. Until our rails and bridges are made to stand the weight and shock from heavier locomotives, the lack of adhesion at starting will have to be overcome by some such device as the sand blast. The cylinders of the high-speed locomotives should be well protected, and the steam and exhaust openings as large and as free as possible. The length of ports and the travel of valves should be made as great as practicable without throwing too much strain on the valve gear. We have found the Allen valve advantageous in high speed engines, as it doubles the steam admission openings at short cut offs. Inside clearance and setting valves to reduce the lead at short cut offs, correspondingly reduces compression and gives us greater power at high speed, and also makes the engine ride easier. Much has been accomplished in the direction of light reciprocating parts by the use of four bar steel cross-heads cast with hollow wings, hollow wrist pins, dished cast-steel pistons and channel main rods, thus correspondingly reducing the counter balance and its effect on the track when at high speed. In order to get the largest boiler consistent with the total weight it has been found advisable to use cast steel driving wheels, hollow crank pins, steel foot plates and other parts, thus reducing unnecessary weight. The reduction thus obtained in a certain engine lately constructed approximates about 30 or 40 per cent. The same consideration applied to freight engines will no doubt prove equally advantageous.

From various sources of information, we get good reports of the economy of compound freight locomotives. I have personal knowledge of a compound freight locomotive that has shown a saving of twenty-three per cent. in pounds of coal per car mile, as compared with the performance of ten simple locomotives, which, excepting the compound principle, are identical in construction, dimensions and weight. The performance of these locomotives was taken for a period of nine months. The expense of repairs to the compound as compared with simple locomotives, is no greater and when a longer period of time has elapsed, I expect to find the cost of repairs to be less than that of a simple locomotive.

The question of economy in shop practice is of vital importance, and in these days of enforced retrenchment we must meet the requirements of such practice. How many of us would look slightingly on the dispensing with even one laborer at the rate of $1.25 per day, in considering the retrenchment necessary in our department? Yet the pay of that one laborer is equal to the interest of $8,000 at 5 per cent. per annum. The saving due to dispensing with laborers, if applied to the purchase of overhead cranes, air hoists and other labor saving devices will make a good return for the money invested.

In closing his address President Garstang spoke feelingly

of the six members of the Association who died during the last year, namely: J. N. Lander, John I. Kiehner, I. C. McNeven, W. H. Selby, W. T. Small and A. R. Barrett.

The Secretary's report showed the present membership to be 600, of which 566 are active, 17 are associate and 17 are honorary members. The membership has doubled since 1888.

The Secretary read a letter from Mr. Robert Quayle, chairman of the Committee on Exhaust Pipes, Nozzles and Smokestacks, in which he said that owing to his having been transferred several times during the year from one location to another and the testing apparatus being located at a certain point, he had been unable to conduct any experiments. He stated that he had fitted up a new testing machine, far superior to the old one, which would enable the committee to give valuable data on the subject.

There followed some discussion relative to the advisability of providing the committee with funds necessary to carry on its work, but no action was taken at this session.

The following reports of committees were read, a synopsis of the discussion concerning which, together with other reports, will appear in our next issue:

Gages For Sheet Metal, Tubes and Wire.

Your committee on gages for sheet metal, tubes and wire, was instructed to confer with manufacturers and others, and to submit a practical system for adoption by the association. It has long been felt that the method of ordering by American, Brown & Sharpe, Stubbs, or other gages, was extremely unsatisfactory, and at the fifteenth annual convention, the micrometer was adopted as standard for measuring sheet metal, but outside of the laboratory and tool-room, its use has been very limited.

It is obvious that to inaugurate the decimal system, as large a following should be gathered together for the purpose as possible, and that if the system were advocated by the leading engineering societies, it would be much more generally adopted.

To this end your committee opened communication with a similar committee of the American Society of Mechanical Engineers, and after much correspondence a joint meeting of the two committees was held in Philadelphia, on November 7, 1894, when the following resolution was passed:

"*Resolved*, That we, the members of the joint committee of the American Society of Mechanical Engineers, and the American Railway Master Mechanics' Association, earnestly deprecate the use of any of the numerous wire and sheet metal, or other trade gages now in vogue, and strongly urge the use of thousandths of an inch for all kinds and classes of small measurements.

"In practice we recommend the use of micrometer calipers or notched gages, the latter with notches of dimensions suited to the convenience of the different industries, and, where necessary, different selections of sizes in thousandths of an inch, suited to each trade, being incorporated in their working gages; provided, however, that these are always dimensioned in thousandths of an inch, and marked in terms thereof, the number of thousandths being marked opposite each gage notch, thus, .001 in.

"We further recommend that the members of the various engineering societies assist the introduction and general adoption of this system by using it in their own work."

Immediately after this joint meeting your committee sent out circulars of inquiry to members of the association and manufacturers, asking for their views relative to establishing the decimal system, and submitting a list of sizes which it was proposed to include in the solid notched gage, and giving for convenience the nearest equivalent in the Birmingham gage.

We give below a compilation of the answers to our circular, as received from members and manufacturers:

Circulars sent to members	587
Circulars sent to manufacturers	430
Total	1,017
Answers received from members	46
Answers received from manufacturers	36
Total	82
In favor of decimal system, members	43
In favor of decimal system, manufacturers	25
Total	68
Opposed to decimal system, members	3
Opposed to decimal system, manufacturers	6
Total	9
Members in favor of micrometer gage	6
Members in favor of solid notched gage	27
Members in favor of both gages	8
Table of thicknesses acceptable to members	36
Alterations desired by members	7
Manufacturers who would fill orders by this system	3½
Manufacturers who would accept system if generally adopted	3½

While it appears from the above that less than one tenth of our members take enough interest in the work of this association to answer a circular that would take them but 15 minutes, yet those answers are practically unanimous in favor of the decimal system. The majority of the manufacturers which answered, will also stand by us in the matter, and while a few sheet iron and tin manufacturers prefer the new United States standard, prominent firms like the Carnegie Steel Company, Allen Wood Company, Lukens Iron and Steel Company, Henry Disston & Sons, Edge Moore Iron Company, Yale Steel Company, John A. Roebling's Sons Company, Coe Brass Manufacturing Company, American Tube and Iron Company and Schoenberger & Co., returned answer which greatly encouraged us in the work and led us to believe that the time is now ripe to step from the darkness of past confusion into the light of common sense.

After receiving these reports another joint meeting of the two committees was held in New York, Feb. 13, 1895, at the house of the American Society of Mechanical Engineers, when the following resolution was unanimously agreed to:

"*Resolved*, That while the micrometer gage should be used for test purposes in the laboratory, yet for general shop use a solid notched gage is desirable. The form of this gage should be an ellipse whose major axis is 4 inches, the minor axis is 2.5 inch and the thickness .100 inch. There should be either one hole .750 inch diameter in center, or one at each of the foci for lightening and convenience. This gage must be plainly stamped with the words 'Decimal gage' in letters .200 inch high, and below this the name of the trade which the group of notches is to cover; these groups to be selected with reference to the needs of the several trades.

"All sizes of notches to be marked in thousandths of an inch without a zero prefixing the decimal point, but with inch marks after the figures, thus, .002″.

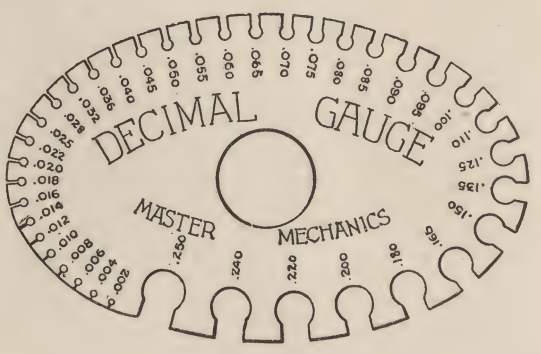
"It is also the intention of this committee that in ordering material, the term 'gage' shall not be used, but merely the thickness in thousandths of an inch."

The object of the elliptical form is to permit a ready distinction from the old style circular or rectangular gages now existing, and also to make it more convenient for the vest pocket

As explained in the resolution of Nov. 7, 1894, various trades may have different groups of notches to suit the necessities of each, but as all notches will have the dimensions given in thousandths of an inch, there can arise no ambiguities, as similar notches will have the same designation on any one of the gages, thus .085″ would mean the same whether on the master mechanics', tinners' or glass manufacturers' gage.

We now have to recommend to this association for its adoption as standard:

1. The micrometer caliper should be used for laboratory and tool-room work, and in the shop when specially desired.
2. The solid notched gage should be used for general shop purposes.
3. The form of this gage shall be an ellipse whose major axis is 4 inches, the minor axis 2.5 inches, and the thickness 1 inch, with the central hole .75 inches in diameter.
4. The notches in this gage shall be as in the illustration of the form of gage recommended.
5. All notches to be marked as in the above list.
6. The gage must be plainly stamped with the words "Decimal Gage" in capital letters .2 inches high, and below this the words "Master Mechanic."
7. In ordering material the term gage shall not be used, but the thickness ordered by writing the decimal as in above list. (For sizes over ¼ inch the ordinary common fractions may be used.)



We appreciate the fact that the standards are practically worthless unless the members put them into everyday use, and we heartily urge them, not only to endorse these recommendations, but to use them.

The Pratt & Whitney Company, of Hartford, Conn., offer to furnish the solid elliptical gages, notched as shown in the cut, for $5 each, if the use of the gage warrants their making the necessary tools for their production.

G. R. HENDERSON, T. W. GENTRY, C. F. THOMAS, A. W. GIBBS, ALEX. GORDON, *Committee.*

Utilization of Railroad Scrap Material.

Your Committee upon the subject of the "Utilization of Railroad Scrap Material and the Best Method of Handling the Same" begs leave to submit its report, as follows:

It is proper to state at the outset that some little difficulty has been experienced in attempting to gain a full expression of facts and opinions from members, owing to the fact that some members consider it unnecessary, if not improper for a railroad to have any scrap pile at all. This is, of course, based upon the use of the word "scrap" as synonymous with "junk." It has seemed to your committee that this was not the meaning intended to be conveyed by the wording of the subject, else there would be no question of the utilization of scrap on the part of the railroads. "Scrap" has therefore been treated as occupying an intermediate position between second-hand material and junk. It may be one or the other. It is more commonly both.

The subject naturally divides itself into the two heads suggested in the title—Handling and Utilization.

The first will include gathering, sorting and arranging, with reference to possible future use or for sale.

The second will include the results of the experience of members in working over second-hand material.

Handling Scrap.—Your Committee has found it impossible to formulate any rule for the handling of scrap which shall be capable of general application, owing to the varying conditions prevailing upon different roads. For instance, many railroads have shops of all kinds located at a single point. Others have shops at several widely-separated points, and in many instances the shops relating to the locomotive department are entirely separated from those of the car department. The distance of any of these shops from each other or from the scrap market, taking into consideration the cost of transportation, also has an influence. It is believed, however, that the suggestions which are applicable in the case of a single central plant may have a partial bearing upon the several smaller shops of a system.

In the case of a single plant, the collection will consist only in bringing to this central point all the various articles of scrap materials accumulating upon the various divisions and such as are picked up along the right of way. With several smaller shops, it would seem best that each should be treated in the light of a central point. By this it is meant that the scrap naturally belonging to it or accumulating in its vicinity should be sorted with reference to two general classes, viz., that which is of probable future use at that point, and that which cannot be utilized at that point. The latter should be shipped to the principal shops for sale or for utilization there. Such scrap as is obviously of no use except for sale may be kept on hand until there is such an accumulation as to enable handling in car load lots. With this exception, it would seem that the treatment to be followed in both cases should be substantially similar.

As the material is unloaded from the car it may conveniently be handled under two classifications—as to material and as to future disposition. This should be done under competent supervision. The first classification may be as finely subdivided as the circumstances in each particular case seem to indicate; but should at least cover the several metals found. The second classification may cover, first, material that can be used again, and is therefore plainly second-hand material only; second, material that can be used again, but which requires additional work or preparation before using; and third, material that can only be sold as scrap. The conditions in each case will govern the amount and kinds of material that will be retained or sold, whether it be all or none.

It will be noted that the plan suggested provides for a double inspection of the scrap material, and for the turning into stock of material that may be used again without preparation. This naturally implies a separation of the material at the main scrap pile into other classes, according as the parts belong to cars, locomotives or the roadway, from which the proper credits may be determined for the several departments.

Your committee is of the opinion that if a road is in position so that it seems desirable to handle scrap material to any extent, a careful supervision by one capable of exercising sound judgment will be found to be an economic measure. The general principles which may well govern the management of the whole subject have been laid down in a paper read during the past year before one of the railroad clubs. They are as follows:

First. The scrap pile should be in charge of persons of as much intelligence as is required for any position on the railroad.

Second. The method of handling the scrap material which is to be put to further use should be as systematic and carefully elaborated as that of handling new material.

Utilization of Scrap.—It is somewhat disappointing that with the exception of one or two instances, there are no figures upon which to base a report as to the difference between the cost of working over old material and the price of the new. This is partially accounted for by the fact that most mechanics would use new material in preference to working over old, were it not that the latter course is, in a measure, unavoidable.

Many classes of scrap may be conveniently used without passing through the foundry or the rolling mill. Bolts may be cut off, straightened and recut. As the bodies of bolts are seldom injured beyond bending (if broken, the breakage is their condemnation), this practice may be continued indefinitely, or until the length is so reduced that they will answer only for track bolts. One member carries the process still further, and when the bolts are too short for use as bolts, they are used as rivets.

A method of treatment of old bolts is suggested, to place them over night in a heating furnace, which serves the purpose of annealing and causes the hard scales to drop off when they are straightened under the hammer. It also softens the metal and saves wear upon the bolt-cutting dies. A saving of about 1¼ cents per pound is claimed for this course of treatment compared with the cost of new bolts. Small bolts are cut down and made into lag screws at a saving of about 2 cents per pound. One member reports 40 per cent. of all bolts as made from old material.

Nuts may be closed up and recut. It has been suggested that they should be pickled in a weak solution of hydrochloric acid to remove rust and prevent undue wear of taps.

A large proportion of the wrought iron which finds its way to the scrap pile can be utilized, provided it has been so sorted that suitable pieces for any special purpoae can be found without the expenditure of so much time as to neutralize the apparent economy. Arch bars, brake connections, brake staffs, bottom straps, drop-door hinges, door slides, etc., are of such section as to be capable of use as carry irons, truck hangers, brake jaws, brake forks, strap for coal cars, etc. Bridge iron and old iron turn tables furnish material for repairs to locomotives and tenders. Turn table plates serve for cross bracing for tender frames, and the channel iron of old bridges will make tank frames and bolsters. Truss rods may be used by welding on new ends, or, when past this point, may be cut up for various purposes, as bolts or brake connections. Tank and boiler sheet-scrap may be used for ash-pan sides and ends, bumper beam plates, wheel covers, large sizes of washers, shoveling sheets on tank floors, floor sheathing under forges, bridges for freight-house platforms, shims, liners, slides, etc.

Links and pins, if not too badly bent or worn, may be straightened and returned to stock. The consensus of opinion is to the effect that welding of such parts is not in the line of economy, though in many instances broken links are welded, and, if circumstances require, standard gage links may be readily converted into links for narrow gage. Old links and pins are made up into hammered iron for side and main rods, engine links, etc.

Coil springs may be utilized by mating an unbroken inner coil with an unbroken outer part. The life, however, will be short, as the elasticity has probably been impaired. Pieces of broken coil springs of large size may be used for pinch bars, jack levers and buggy-bars for engines. Flat or semi-elliptic spring leaves may be used for repairs to other springs, rod liners, equalizer rigging, keys, plates and spring clips, small wrenches, brake-beam guide springs for passenger-car trucks, drawhead keys, slide plates for split switches, etc.

Old flues are sometimes used to advantage in making drain gratings under water tanks, for cattle guards, over cinder pits, etc., and for ash-pan and other split keys. In this case they are flattened and punched to the required shape under the steam hammer. One member calculates a saving of 50 per cent. in using flues for cinder-pit gratings. Flues also make excellent material in the manufacture of whistling and crossing signs, and for fences about depots and grounds.

Scrap axles are used for a variety of forgings, such as equalizers, pedestal and frame braces, brackets, mud rings, smokebox rings, equalizer fulcrums, arch bars, drawbars for engines—both front and back, swing-beam hangers, Miller hooks, truck frames, engine and tender chafing plates, wrenches, piston rods, crank and rod pins, main and connecting rods, rod straps, etc. One of the members of your committee utilizes narrow-gage axles, which are straight in the center, by cutting off the journal ends and cutting the middle part in two pieces. By welding three such pieces together, making two new out of three scrap axles, a considerable economy has been developed. Old axles may frequently be worked into virtually new axles, which come up to the original standard in strength and elasticity. A good method, where there are suitable facilities, appears to be to roll the old axles into bars 3 × ¾ inches and cut into 3 feet 6 inches lengths. These plates are placed together in sufficient numbers to make the axles required. By this method the particles seem to become enlongated and produce fibrous metal capable of enduring ordinary tests and service.

Old hand-car axles are used to make crank axles on new hand cars, at a saving of $1.25 on each axle. Surplus stock of this class is made up into fence posts along the right of way. Piston rods, hand-car axles, small car axles and main rods can often be conveniently used for the motion work of the locomotives, being case-hardened after finishing. Upon one road, old steel driving axles are used over again at a reduced size, being annealed by wood fire during the several stages. For instance, an 8-inch axle is reduced to serve at 7½ inches, then at 7 inches and finally at 6½ inches, that being the smallest size used. From this stage it is made into crank pins, and from that to blacksmiths' tools. Old steel tender axles are used a while as engine-truck axles, and finally end in the same manner. Guide yokes are sometimes made from iron axles.

Old tires are in some instances converted into rod straps for engines, filling pieces for frog points, and blacksmiths' tools. Your committee have no figures on the economy of working up old tires, with the exception of the experience of one member who found that the cost of some hand hammers made of old Krupp tire was $8,98 per dozen, as against $4.50 per dozen for new hammers. He discontinued the operation. However, at the same shop, coal hammers, lining bars, claw bars, and some classes of wrenches have been make at a profit from the same material. Fish plates are successfully converted into rail braces at a cost of a cent apiece. Worn-out steel rail is converted into brake beams by working out the head of the rail to the same thickness as the web, leaving the base in its original shape. This is then sheared to the proper shape, making a good beam out of worthless material at a cost of about 40 cents for labor.

In conclusion, it may not be out of place to express the belief that though the scrap pile was once considered only as the "inarticulate witness of our blunders and the sepulchre of our blasted hopes, the best but most humiliating legacy we are forced to leave to our successors," it is not necessarily so, and the humiliating feature may wholly be removed by a correction of the blunder we have made in metaphorically kicking the loose bolt under the bench rather than putting it on the shelf.

H. J. SMALL, H. MONKHOUSE, HENRY SCHLACKS, GEO. W SMITH, H. P. ROBINSON.

The Debs Decision.

As showing a good example of how the non-technical press of the country regards the final condemnation of Debs and those associated with him in the railroad riots a year ago, we republish the following clear and vigorous editorial on the subject from *Harper's Weekly* of June 8 :

Eugene Debs and his associates of the American Railway Union must go to prison for contempt of court. The country is to be congratulated on the recent decision of the United States Supreme Court, because our highest tribunal has declared that the government may protect its property, enforce its rights, and exercise its powers in such a case through the medium of the court. Debs disobeyed an injunction issued by the United States Courts to restrain him and his mob from interfering with the transportation of the mails and interstate commerce. The interference of the courts was denounced by the friends of anarchy as "unwarranted" and unconstitutional. It was certainly a new proceeding, as the assertion by Attorney-General Olney that the President could call on the government to protect the mails and to keep open the highways which are traversed by the commerce between the States was also a new and vigorous expression of national authority. All doubt has been brushed aside by the Supreme Court, speaking through an unusually vigorous opinion by Justice Brewer. As the law stands, the government of the United States, through its courts, can prevent the commission of any act, or can punish the person offending, as it can interfere with its army acting as a police force. Wherever the whole country has interests, the United States can protect them against the assaults of individuals. The law as now laid down is contained in Justice Brewer's summing up. Its essence is to be found in these words: "We hold that the government of the United States is one having jurisdiction over every foot of soil within its territory, and acting upon each citizen; that while it is a government of enumerated powers, it has within the limits of those powers all the attributes of sovereignty."

After this all combinatians or unions of men who propose to bring their employers to terms by obstructing traffic, stopping the mails, and bringing the railroads, and the business dependent upon their regular operation, to a standstill, will understand that they must reckon with the United States. It is always better for the healthful political life of a community that all revolts against the law shall be prevented or punished by the local authorities and the local police. But the power to do this must be accompanied by the will to do it on the part of those who for the moment are in authority. When this will or inclination is wanting, however, appeal must be made to the national arm, when the crime is within the national jurisdiction. When war is made upon interstate commerce within a State whose Governor is a friend of anarchy, and in a city whose Mayor is afraid of the anarchist vote, there will be no hesitation after this decision in the Debs case as to the course to pursue. The United States Courts are not afraid of the local vote, and the officers and soldiers of the United States Army are not dependent for their employment on the good will of law-breakers. Hereafter, if the country shall be unhappily treated to another Chicago railroad riot, there will probably be less discussion as to the power of the general government and prompter action. The railroads engaged in carrying the mail and in carrying on interstate commerce are now under the protection of the courts and the executive power of the United States.

A Serio-Comic Wreck.

The Chicago *Tribune* publishes the following account given by the negro porter of a Chicago, Rock Island & Pacific pay car that was ditched at Stockbridge, Mo. A broken switch let the engine and forward trucks of the car go down the main line while the rear trucks tried to go on the side track. The car bumped over the ties at the rate of 30 miles an hour, then turned completely over and landed on its roof outside the right of way. One man was seriously injured and the rest severely hurt.

"We wuz flyin' 'bout a hunded mile an houah," said Frank. "Mistah Mack was jest lettin' huh out, I tell ye All to once, pumpety, bumpety bump, all the furniture c'mence to jump up like it wuz tryin' to go troo de roof," the jumping of the furniture being illustrated by Frank jumping violently up into the air and coming down stiff-legged. "Den we c'mence rollin' ovah and ovah till I thought we nevah would stop. Mistah Purdy and de rest of de gen'lemen in de cah went sailin' 'round froo de air, an' every once in a while biff dey'd come up agin a window light or somethin' and dey wouldn't be no mo' window light. I wuz tryin' to tell 'em not to be skeered when kesmash goes my head and shouldahs froo somethin'. I must a fell fawty feet and I lit head fust right on de seat of a cain-bottom cheer. I lit so hawd that I shot clean froo, head, neck and shouldahs. Den dat pesky cheer dropped down to de roof and got wedged in so tight I couldn't move it, and dar was my ahms jammed froo de seat so tight I couldn't budge 'em. And, suh, de watah coolah I jest filled up full ob ice got a hole punched in it, and my laig was right smack up agin dat hole, and I just had to stand dah on my head while 'bout foah barrel of ice watah run down my pants laig and come out undeh my collah. Couldn't do nothin' but lean up dah and take it. I waz so cold I guess it made me hollah 'O-o-o-o-oh!' once or twict, and, suh, Mistah Purdy and de rest dat I've took de best o' care of foh years on dis pay cah, lef' me thah tell everybody got out an' looked aroun' an' then, finally, when they had concluded to see what had com o' me, 'sted o' helpin' me loose they jest stood an' laffed at me tell I thot they'd have a duck fit."

The Southern Pacific's car repair shops at Portland, Ore., were destroyed by fire June 12, together with 15 freight cars and one caboose.

Changes Wrought by Railways.

That the railway has become an integral portion of modern existence is nowhere more fully demonstrated than upon an ordinary morning business train. The man of affairs enters with an accustomed air, drops promptly into a seat and falls diligently to the perusal of his morning paper or his note book, as if the journey were but a trifling item in the routine of his daily labor. Children, laden with school books, dash into seats with the same accustomed ease, and infants handle their mile books and purses with a composure and skill startling to behold.

The alteration in habit within a single generation only claims attention when an old man relates that in his childhood in a maritime town it would have been a matter of serious inconvenience and much consideration to make a trip of thirty miles inland. An octogenarian of New England has recently told us that in his boyhood it was a theme for general interest and speculation when a Bostonian ventured as far afield as New York City. The sagacious Peter Parley, who esteemed himself with justice as a very up-to-date member of his generation, congratulated himself upon the good fortuue of having been born on the high road leading from Boston to New York, and thus being led at an early age to appreciate the advantages of travel and the lessons to be learned therefrom. People staid close at home to an extent incredible to us in our present usages. Stage coaches were rare. and the journeys of the solitary horseman much more picturesque than convenient, and not to be justified by slight occasion. That a man should undertake a daily avocation at a distance of thirty miles from his residence, or that a child should go a like distance to school has been only the result of the strenuous labor of the railway with its numerous improvements. The effect of steam upon society, upon education, upon all departments of life, is incalculable. Schoolboys are taught the importance of the old Roman roads, but the steam road is so familiar to many that its position as a physical and mental factor is disregarded.—*Railway World.*

The Blacksmith's Scowl.

A writer in *Blackwood's Magazine* expresses the opinion that the characteristic trade expression of blacksmiths is a scowl resulting from the exigencies of their work. He says:

"To disguise himself, the blacksmith has only, if possible, to put on a smile, and a frank and open expression. As the smith wields his hammer with an energy that has something fierce and vengeful about it, he automatically contracts his brows into a frown. He does this partly, no doubt, to protect his eyes from the flying flakes of metal, but if you watch the face of the man who holds the iron on the anvil, you will find that, although he lowers his eyebrows somewhat, as the sledges descend, he does not scowl, as do the strikers. In most blacksmiths the constant exercise of the *corrugator supercilii* muscles causes a permanent frown, and gives the face a somewhat hard expression.

"I remember being a good deal impressed when visiting in a shipbuilding town, by the intent gaze and bent brows of the riveters and boilersmiths with whom I was brought in contact. One instinctively wondered at first what there was about a harmless hospital surgeon, who ministered to them in times of dire trouble, to excite such an air of watchful hostility. I soon found, however, that no hostile sentiments were entertained, but that the frowning, falcon-like expression was explained, partly by the 'smith's scowl,' above mentioned, and partly by the fact that all these men were rendered somewhat deaf by their noisy work, and, in consequence, had a habit of closely watching the face of anyone who conversed with them."

Light Cars.

The Sheffield Car Company, of Three Rivers, Mich., makes a specialty of the manufacture of light cars of every description. This company has recently sent us a handsome pamplet that illustrates and describes the variety of types of cars it makes. These include almost everything from ore and coke buggies to hand cars and street cars. Some excellent forms of water cranes or stand pipes for locomotives are also made by this company. Railroad officers contemplating the purchase of light cars of any description should correspond with this firm.

Singularly enough, iridium, though a metal of such comparative rarity, is said to be a source of no small trouble in the operations of our mints, on account of the difficulty experienced there in separating it from gold bullion. Practically, as is well known, this metal is utilized to some extent for making instruments of delicacy which require to possess the property of not corroding, and is obtained from iridosmine, a natural alloy of iridium, osmium, rhodium, platinum, and ruthenium, an extraordinary white mixture of rare metals, much of it being found in washing for gold in the beach sands of Oregon, and it resists the action of all single acids. In its use for tipping gold pens, in which it is specially serviceable, the grains of it, which are flat, like gold-dust, are picked out with magnifying glasses.

Among the manufacturers of high grades of felt roofing, building and sheathing papers, there is none more favorably known in the United States than the Jowitt Carbonized Felt Co., of 66 Maiden Lane, New York. This firm was established in 1880, and for 15 years its productions have commanded a large sale and enjoyed the prestige of being the best known to the trade. They have stood all practical and scientific tests for durability and economy. The company has a well equipped plant at Stanley, N. J., and the specially made carbonized felts turned out there are absolutely water, weather and vermin proof, unaffected by temperature, and do not crack or become brittle, easily unroll without sticking, and resist the action of acid, salt fumes and hot gases. These are important qualities in car construction and other railroad structures, and this company's materials are used by some of the leading American railroads and the United States Government.

Exhibits at the Conventions.

The exhibits of railroad mechanical appliances at the recent conventions of the Master Car Builders' and Master Mechanics' Associations at Alexandria Bay contained numerous improvements of interest to those in attendance. The following is a list of all the exhibits.

Acme Coupler Company, New York City, car coupler; represented by A. D. Keys, F. A. Fox and Frederick A. Guild.

Alexander Car Replacer, of Scranton, Pa., car replacer.

Adams & Westlake, of Chicago; represented by H. E. Kesler.

American Balance Slide Valve Company, of San Francisco; balance slide valve for locomotives; represented by Mr. Wilson.

American Ball Nozzle Company, of New York City.

American Steel Castings Company, of Thurlow, Pa., open-hearth cast steel driving wheel center; represented by W. A. Blanchard.

Allison Manufacturing Company, of Philadelphia; car door.

Automatic Injector Company, of Cincinnati, O.; Hogue and Climax Injectors; represented by J. V. Motter.

A. French Spring Company; pressed steel box lid, pressed steel spring plates and elliptical and spiral engine and car springs; represented by George W. Morris and D. C. Noble.

Acetylene Gas Company, New York; exhibt of car lighting system in Crossman House; represented by J. Mitchell.

Baker Heater, New York.

Barbey & Co., F. A., of Boston; flexible steam joint coupling.

Bird & Son, F. W., of East Walpole, Mass.; Neponset roofing; represented by M. A. Garrett.

Bundy Manufacturing Company, of Binghamton, N. Y.; represented by A. E. Bundy.

Boston Belting Company, of Boston; hose and rubber specialties; represented by George H. Forsythe and F. F. Alden.

Boies Steel Wheel Company, of Scranton, Pa.; steel wheels.

Bushnell Manufacturing Company, of Easton, Pa.; represented by Mr. E. M. Bushnell.

Butler Draw Bar Attachment Company, of Cleveland; draw bar attachment; represented by W. W. Hayward.

Buckeye Malleable Iron & Coupler Company, Columbus, O.; car coupler; represented by John E. Howe, James Tims and Wm. E. Maher.

Columbian Metallic Rod Packing Company, of Philadelphia; represented by George O. Wilson.

Chase, L. C. & Co., of Boston; car seat plush.

Chicago Grain Door Company, of Chicago; grain door; represented by James L. Mallory.

Consolidated Car Heating Company, of Albany, N. Y. heating and Pope lighting systems; represented by Chas. A. Sheldon. J. F. McElroy, R. P. Scales, W. P. Walman and Frank P. Foley.

Crosby Steam Gage and Valve Company, of Boston; represented by Edward C. Bates.

Chicago Railway Equipment Company, of Chicago; National hollow brake beam, represented by E. B. Leigh, A. J. Farley, L. C. Burgess and Fred Ely.

Chicago Pneumatic Tool Company, of Chicago; pneumatic hammer; represented by President John W. Dunkley.

Damascus Bronze Company, of Pittsburgh; main rods and side brasses in Damascus and Phosphor-Bronze; represented by John T. Brown.

Davis Car Shade Company, of Portland, Me.; car shades; represented by E. E. Piper, C. M. Fuller and J. T. Fuller.

Dey Time Register, of Syracuse, N. Y.; automatic time register; represented by E. E. Matthews.

Dumping Car Improvement Company, of New York City; full sized dumping car; represented by William McMahon, Hector DeCastro and D. S. Robeson.

Detrick & Harvey Machine Company, of Baltimore; Adams bolt cutter; represented by T. M. Brown.

Ensign Manufacturing Company, of Huntington, W. Va.; photographs of the Russell snow plow.

Filley, A. E. & Co., of New York City; represented by Horace Jones.

Fox Solid Pressed Steel Company, of Chicago; represented by W. O. Jaquette and James B. Brady.

Flohr's Car Coupler, Buffalo; car coupler; represented by J. H. Bradford.

Foster Engineering Company, Newark, N. J.; pressure regulators, reducing valve, pump governors, inside safety boiler checks, locomotive engineers' order clips; represented by J. M. Foster.

Gold Car Heating Company; car heating system; represented by Egbert H. Gold and Edward E. Gold.

Gould Coupler Company, of New York; car tender and pilot coupler, Gould continuous draft rigging; represented by C. W. Gould, E. F. Luce and George O. Weidner.

Hayden & Derby Company, of New York, exhibited locomotive injectors, Metropolitan type.

E. Harrington, Son & Co., Philadelphia, Pa., represented by Mr. Wm. H. Harrison; the Harrington screw hoist, machine tools adapted to railroad shops. Locomotive gang frame drill, four and six-spindle gang drill, radial and regular upright drills, car box boring machine, hand hole trimming machine for boiler work, stayboit nicking machine, extension bed engine lathes.

Hammett, M. C., of Troy, N. Y.

Hutchins, C. B., & Sons, of Detroit, Mich.; car roof; represented by C. H. Hutchins and D. D. Anderson.

Hamlin Car Step Company, of Portland, Me.; drop car step; represented by A. D. Hamlin.

Hale & Kilburn Manufacturing Company, of Philadelphia; car seats; represented by H. E. Hale, Warren Hale, Harry T. Bigelow and Chas. Barrett.

Hendrick Manufacturing Company, of Carbondale, Pa.; perforated metals; represented by C. E. Retten.

Inderlied Coupler Company, of Rock Rift, N. Y.; car coupler; represented by E. C. Inderlied.

Johns, H. W., Manufacturing Company, New York City; asbestos goods; represented by F. M. Patrick.

Jerome Metallic Packing, of Chicago, model of packing and McIntosh's blow-off cock; represented by George C. Jerome.

Knitted Mattress Company, Canton Junction, Mass.; textile fabrics; represented by F. Sumner.

Kanaly, M. E. Company, of Cambridgeport, Mass.; standard steel door hangers; represented by A. L. Whipple, Jr.

Keasbey & Mattison Company, of Ambler, Pa.; represented by W. W. Johnston and Thos. Rose.

Ludlow Coupler Company, of Springfield, O.; car coupler and Miner drawbar attachment; represented by J. T. Ricks and J. D. Rodgers.

Leach, H. L., of Boston; pneumatic sanding device for locomotives.

Lone Star Coupler Company, of Houston, Tex.; car coupler; represented by Thos. H. Wheless, J. N. Maher and Thomas Aldcorn.

Moran Flexible Steam Joint Company, of Louisville, Ky.; steam joint; represented by H. U. Frankel and T. W Moran.

Moore Car Door Company, of Chicago; car door; represented by Belden D. Jones.

McGee, James, of Houston, Tex., improved beamless brake.

Major, A., of New York City; ice float for water cooler.

Massachusetts Mohair Plush Company, 89 Franklin street, Boston; car and furniture plush; represented by W. D. Sawyer.

McConway & Torley Company, of Pittsburgh represented; by C. P. Krauth.

Norton, A. O., of Boston; ball bearing screw jack and

"Sure Drop" track jack; represented by A. O. and H. A. Norton.

National Railway Spring Company, of Oswego, N. Y.; springs; represented by Edward Cliff and George P. Sloan, Jr.

National Mealleable Castings Company, of Cleveland, Chicago, Toledo and Indianapolis; the Tower coupler, Eubank car door, Coffin carline and sill pockets and malleable castings; represented by Willard A. Smith, C. L. Sullivan, J. V. Davison, S. L. Smith and F. R. Angell.

National Car Wheel Company, of Buffalo; car wheels; represented by W. H. Fenner and W. W. Turlay.

New York Belting and Packing Company, of New York; represented by A. F. Conklin.

New York Coupler Company, New York; car coupler; represented by John LaBurt.

New England Machine Company, of Boston; the torpedo injector; represented by J. D. Mack.

North Carolina Car Company, of Raleigh, N. C., was represented by President Wm. E. Ashley.

Park Coupler, Montpelier, Vt.; car coupler; represented by A. W. Stowell.

Pero Automatic Car Oiler Company., of New York; car oiler; represented by John D. Sheldon.

Peerless Rubber Manufacturing Company, of New York; hose and rubber specialties; represented by C. H. Dale, H. W. d'Evers and C. S. Prosser.

Patent Self-Oiling Axle and Journal Company, of Baltimore; represented by James S. Patten and Morton Schaeffer.

Pratt & Lambert, of New York and Chicago; panels showing "Faultless" varnishes and "Bellamy" filler; represented by W. H. Andrews, J. P. Gowing, C. L. Bellamy and John B. Hicks.

Prosser, Thos. & Son, of New York; Krupp steel tires and wheels; represented by Thos. Prosser, Jr., George Bryant and J. V. Motter.

Pottier & Stymus Company, of New York City, car seats; represented by A. J. Stott.

Penn Steel Casting and Machine Company, of Chester, Pa.; the Gelston rotating head coupler; represented by E. C. Smith.

Q. & C. Company, of Chicago; McKee brake slack adjuster and Williams locomotive valve setting device; represented by J. K. Lencke.

Rand Drill Company, of New York; air compressor.

Roosevelt-Wheeler's Draft Box, Austin, Tex.; represented by Thos. H. Whelers.

Ross Valve Company, of Troy, N. Y., display of steam car heating, regulating and reducing valves; represented by President, Wm. Ross.

Simonds Rolling Machine Company, of Fitchburg, Mass., showed steel balls and forgings, brake pins, etc.

Stowell, W. A., of Montpelier, Vt.; car coupler.

Sams Automatic Car Coupler Company, of Denver; represented by L. D. Sweet.

Safety Car Heating and Lighting Company, of New York; Pintsch light; represented by J. J. Cody, C. H. Howard, R. M. Dixon, Merle Middleton and O. C. Gayley.

Sennett, L., Automatic Air House Coupler, of Russell, Ky.; air hose coupler; represented by O. G. Temple.

Smillie Coupler Company, of Newark, N. J.; car coupler; represented by C. H. Taylor.

Schellenberg Safety Car Wheel Company, of Detroit; car wheel; represented by James Rigby.

Simons, J. E., of McKees Rocks, Pa.; drop-door car.

Sewall, J. H., of Worcester, Mass.; standard brake slack adjuster.

Scarritt Furniture Company, of St. Louis; car seats; represented by S. G. Scarritt.

Schoen Manufacturing Company, of Philadelphia; pressed steel bolster, stake pockets, corner irons, etc.; represented by Charles T. Schoen and J. T. Milner.

Standard Steel Works, of Philadelphia; represented by T. J. Lewis.

Syracuse Malleable Iron Company, of Syracuse, N. Y.; the Burns car coupler; represented by W. B. Burns and T. F. DeGarmo.

Shickle, Harrison & Howard Iron Works, of St. Louis; steel body and truck bolsters and car coupler; represented by J. W. Duntley.

Standard Paint Company, of New York City; represented by Messrs. J. N. Richards and F. F. Vandewater, who were on hand to explain the superior merits of P and B Ruberoid car roofing.

Taylor Car Door Company, of Chicago; flush car door.

Taylor Iron and Steel Company, High Bridge, N. J.; sections of steel tired wheels; represented by J. H. Sheldon and E. F. Luce.

Tilden Company, B. E., of Chicago, car replacers; represented by B. E. Tilden.

Union Grease Company, Boston; lubricants; represented by C. M. Fuller and William H. Drury.

Vessot, S. & Co., of Joliette, P. Q., Canada; represented by A. King.

Westinghouse Air Brake Company, of Pittsburgh; represented by Messrs. Parke, Evans, Bailey and Nellis.

Williams Typewriter Company, of New York City; typewriter; represented by Henry Day Wilde.

Yerdon, William, of Fort Plain, N. Y.; improved double hose band.

The Eastern hemisphere, on which dwell 92 per cent. of the population of the world, has 170,792 miles of railroad, or 46 per cent. of all railroads.

A nut came off the running gear of the buggy, and the occupant asked an Italian who chanced along if he had a monkey-wrench. The man accosted roared back: "Whata for you insulta me? I no keepa a monkey ranch. I keepa da sheep ranch!"

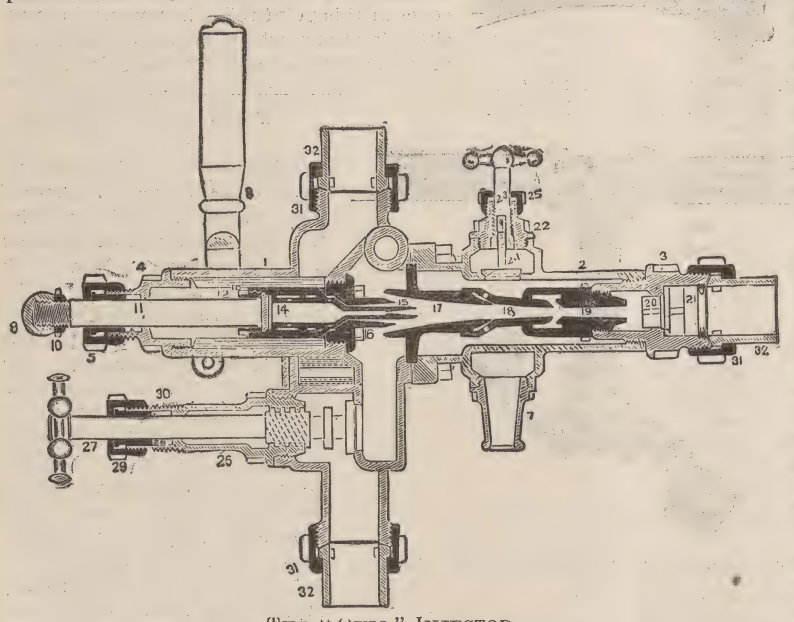
Mr. Auguste Strindberg, says the *Annales Industrielles*, asserts as the result of numerous experiments made by him, that sulphur is a compound of carbon, oxygen and hydrogen, in proportions as yet undetermined. He goes still further than this, and claims that it is not only not a simple body, but not even an original one, being merely a common fossil resin or bitumen.

The output of California dried fruit in 1894, including raisins, was 8,550 carloads, divided as follows: Raisins, 4,300 carloads; prunes, 1,450; apricots, 1,250; peaches, 1,200; miscellaneous fruits, 100. The raisin industry of of California has been so unprofitable to both growers and packers during the last two or three years that it is reported that the acreage heretofore under cultivation in Fresno and adjacent districts will be largely reduced this year.

The Weather Bureau has kept a record of persons killed by storms and lightning since 1891, and the total number is 784, or an average of 196 per year. During the past eight years, according to the statistics of the insurance companies. 3,516 fires were caused by lightning, with a total loss of $12,000,000. Most of the damage from lightning was on flat land and in the country; and 54 per cent. of the trees struck were oak, 22 per cent. elm, and 15 per cent. pine.

The "Ohio" Injector.

The sectional view herewith shows the interior construction of the "Ohio" injector, an improved locomotive boiler feeder recently placed on the market. Although its advent was less than a year ago it is already in use on over 30 different railroads and there has not yet been a single adverse criticism. It is a lifting injector. It is made in two styles, one with a screw attachment for starting and one with a lever attachment. It is interchangeable with the principal injectors in use, thus incurring no expense in attaching it. The intermediate tube, No. 17, is held in place with body of machine when screwed together. In this way no tubes are broken in taking them out for cleaning. All tubes are made from a metal especially prepared for this purpose and the wearing capacity cannot be surpassed. The cost for repairs in this way is reduced to a minimum.



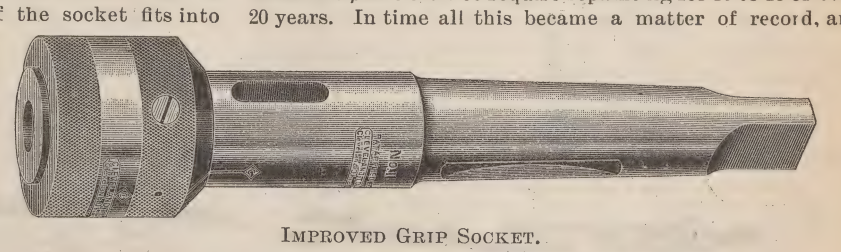
THE "OHIO" INJECTOR.

The body of the injector is made in two parts and bolted together so that it is easily taken apart for cleaning. The condensing tube, No. 18, and delivery tube, No. 19, requiring attention before any of the others, are screwed to the line check and can be taken out with the ordinary wrench without disturbing the other parts until such time as it is necessary to replace them and clean the body of injector. The injector will start promptly under all conditions required of it on a locomotive. It has an unusual range of delivery and works equally well whether the minimum or maximum quantity of water is required. It can be graded fine enough to run a locomotive light or will supply it while pulling the heaviest trains. This injector is constructed so as to use the least possible quantity of steam and secure the greatest efficiency. In using less steam the tubes will not lime up so badly. Liming of the tubes is caused by the heat of the steam in bad water and the less steam used the less liming up of the injector and the more economy in fuel. Injectors of this type in actual service for the past two years have proven this.

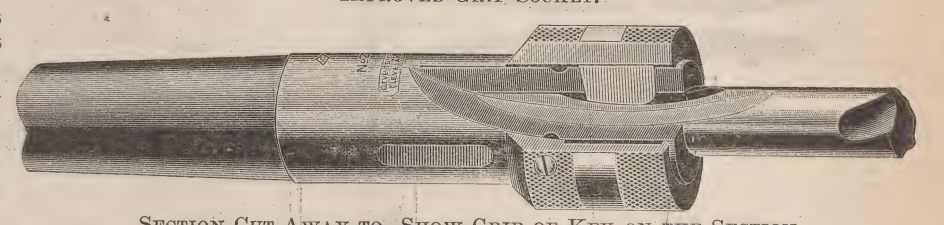
The office of the company manufacturing this injector is at 1,302 Monadnock Block, Chicago, and Mr. Frank W. Furry is the General Manager.

An Improved Grip Socket.

The following engraving shows an improved grip socket made by the Cleveland Twist Drill Company, of Cleveland, O. It is designed to hold and drive taper shank drills and other tools. A groove, which is an arc of a true circle, is milled in the shank of the drill or tool—as shown in above illustration—a key let into the body of the socket fits into groove, and is locked securely in place by a turn of the revolving internally eccentrically counterbored collar. After the key is locked it is impossible for the tool to slip in the socket or to be pulled out, until the collar is turned back again to release the key. The end of the collar is beveled and a plain index mark on it and on the body of the socket showswhen the key is released.



IMPROVED GRIP SOCKET.



SECTION CUT AWAY TO SHOW GRIP OF KEY ON THE SECTION.

Drills or tools that have had the tangs on the shanks twisted off can be used in these grip sockets successfully, and in this way the cost of the sockets can be saved many times annually. Boring bars for under cutting can be used without any danger of their pulling out of the sockets, and the labor and expense of turning over heavy pieces saved.

This daily grind of work is making me awfully dull. Well if you were the right kind of metal, grinding would sharpen you.

A little unnecessary excitement has been aroused lately by the discovery that some Birmingham metal manufacturers have been making idols to be worshiped by the heathens in India. They probably executed orders for which they were well paid, and it was hardly their business to stipulate that their wares should be used for ornament only. Besides, before we are too hard on the heathen, we should remember that if their idols of gold and silver were melted down and sent to the mint, they would reappear disguised as coin of the realm, and a good many Christians would worship them then.—*Iron Age.*

A New Device for Making Pipe Joints Tight.

Within the past two years the Tight Joint Company, of 150-152 Bank street, New York City, has introduced an improved class of fittings known as the "Tight Joint," mention of which was made in our last issue. The "tight joint" is similar to an ordinary fitting, except that a groove is cast in the threaded portion of the fitting, into which a collar or ring of lead is run. This is formed upon a threaded mandrel of slightly smaller size than the fitting, so that the lead projects a very little beyond the threads. A small hole with a thread cut in it is made through the exterior of the fitting, into the lead-filled recess, and a small set screw inserted. If a pipe be screwed into the fitting it will expand the leaden packing, causing it to tightly fill the screw threads, and if the joint is not made tight by this means, one or more turns of the compressing screw crowds the lead around the pipe and makes the joint absolutely tight. The "tight joint" is especially adapted for use in connection with steam, water, air, oil and gas pipes, for air brakes for cars and for all pressures where difficulty is experienced in making tight joints. Some of the most prominent railroad companies are now using these fittings and recommend them in the highest terms.

That this method, simple as it is, is effective in securing tightness can be surmised from the fact that in experiments with these joints in official tests at the Navy Yard in Brooklyn, the screwing of the pipe in the fitting having been done by hand, the turning of the set screws was enough to stop a leak thus purposely produced, and the joints remained tight and dry under a pressure of 240 pounds of steam to the square inch. Under a pressure of 1,100 pounds liquid petroleum, leaks purposely created were similarly stopped. Under 1,800 pounds hydraulic pressure the same tightness was secured, and finally 3,300 pounds were reached and held. Experiments of the same kind made at the Stevens Institute of Technology, but much more severe, have furnished entirely corroborative results, The joints, set screws being set after a leak had been purposely produced, held 300 pounds ammonia gas pressure, 300 pounds steam pressure, 1,700 pounds air pressure, 3,000 pounds refined petroleum oil pressure, gradually increased to 10,000 pounds and 12,000 pounds per square inch. In another case, the joints stood without leaking 16,000 and 17,800 pounds hydraulic pressure, at which last named figure the metal of the fittings used, and that of the connecting parts, began to pull apart.

Mr. J. Faessler, of Moberly, Mo., makes a specialty of the manufacture of roller tube expanders, and beading expanders and ball reamers. We have heard Mr. Faessler's tools very highly spoken of in different shops, and he has received a number of endorsements from well-known railroad mechanical officers. As a sample the following may be cited from Mr. F. A. Chase, Master Mechanic of the Kansas City, St. Joseph & Council Bluffs Railway:

"We are well satisfied with the expanders got from you, and like them better than any other make on account of their simplicity and durability."

Mr. Faessler has prepared a neat little pamphlet that fully describes and illustrates his several specialties. Those interested in the best tools of this character should send for one of these.

Twenty-five or thirty years ago the Dixon Company, of Jersey City, N. J., began the manufacture and introduction of graphite paint. Ticonderoga flake graphite was used and thoroughly ground in pure boiled linseed oil. Roofs well painted with this paint did not require repainting for 10 to 15 or even 20 years. In time all this became a matter of record, and people recognizing the economy, as well as the durability of Dixon's graphite paint and its great superiority over mineral paints, demanded that their roofs should be painted with it. This demand, however, has led many painters to resort to sharp practices. Some painters are unprincipled enough to offer as graphite paint a compound having the color of graphite, but composed of stove-polish, cheap black lead, or even foundry facings, mixed with oil. Other painters, honest in their intentions, but ignorant that there is a vast difference in graphite, have used ordinary commercial black lead, ground with oil, expecting it would meet the requirements of their customers and prove lasting. An experience covering a quarter of a century and over, has demonstrated that the peculiar flake graphite, mined at Ticonderoga, gives the best results. When the paint is brushed out each flake laps over its fellows, after the manner of fine fish scales, forming a covering of great elasticity and durability.

Ball Nozzles.

In our last issue we mentioned the interesting exhibit of the Automatic Ball Nozzle Company, on Broadway and Thirteenth street, New York. Herewith we present a few engravings that show the adaptability of this curious arrangement to various purposes. The action of a stream of air or water passing through this nozzle does not displace the ball, no matter how violent its force; it simply imparts a rotary motion to the ball, which in turn causes the most effective spraying of the stream imaginable. Its various arrangements are exceedingly numerous and range from lawn sprinklers to fire hose. As mentioned in our previous notice,

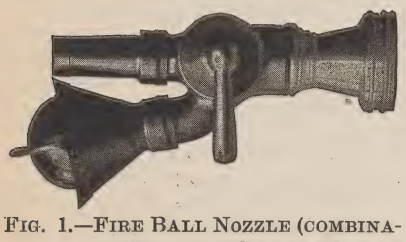


FIG. 1.—FIRE BALL NOZZLE (COMBINATION), STRAIGHT STREAM, SPRAY AND SHUT-OFF.

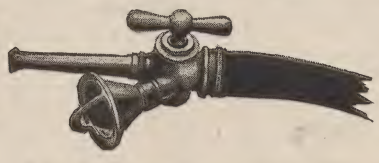


FIG. 2.—COMPRESSED AIR AND WATER SPRAYING NOZZLE.

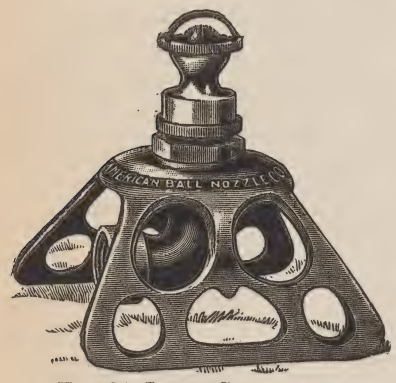


FIG. 3.—LAWN SPRINKLER.

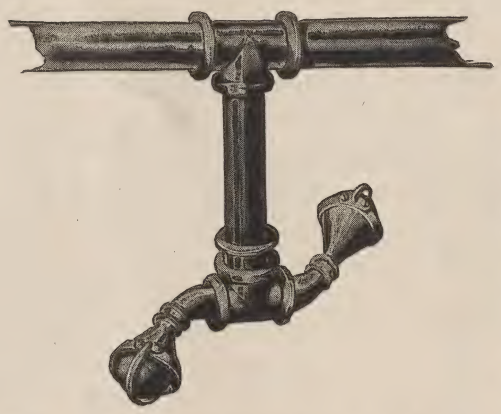


FIG. 4.—REVOLVING SPRINKLER FOR FACTORIES.

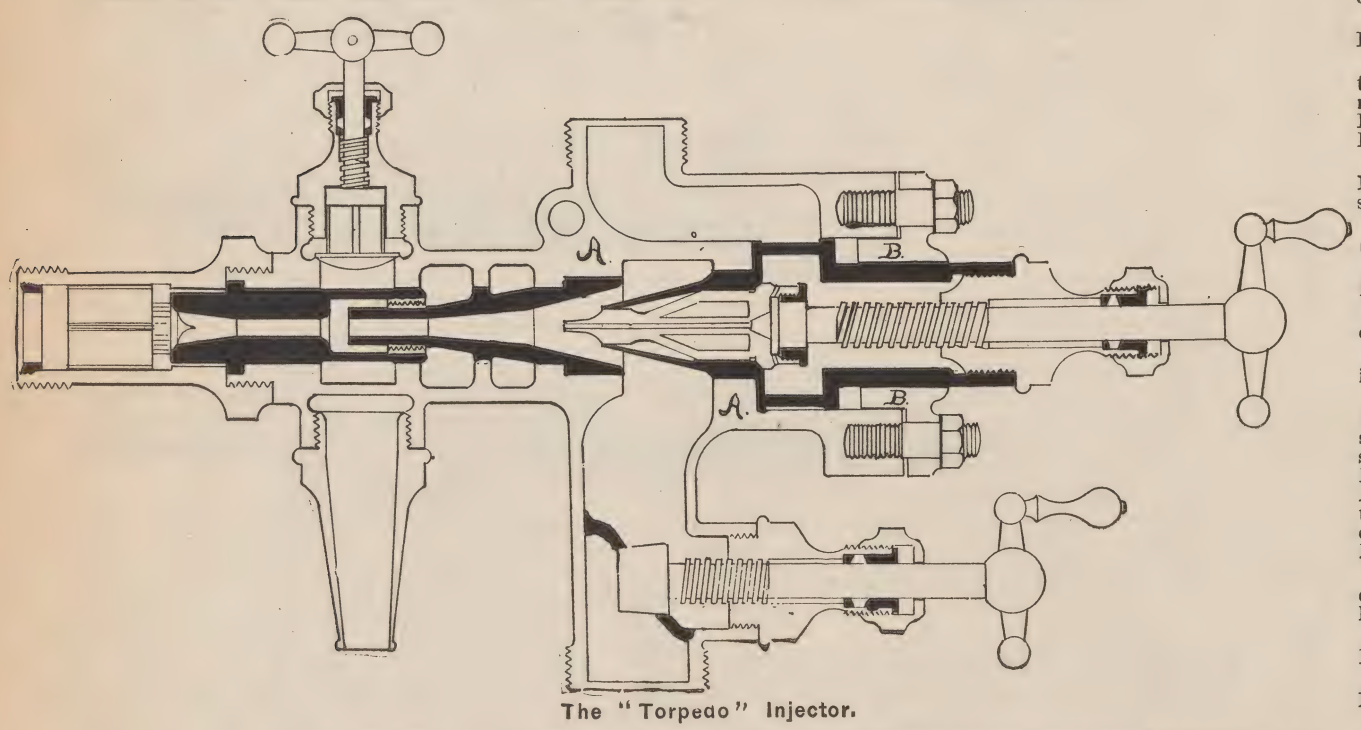
it is many times more effective in putting out fires than the ordinary single stream, because of the wider area of surface it is capable of instantaneously wetting. Being a perfect spraying nozzle it is very useful for handling compressed air for cleaning purposes, and paint or whitewash in their application by compressed air.

Our first engraving (Fig. 1) shows what is known as a fire ball nozzle, combining arrangements for either a spray or straight stream and a shut-off cock. Fig. 2 shows a 1-inch ball nozzle for compressed air and spraying water. Fig. 3 shows this device arranged as a lawn sprinkler, and Fig. 4 shows the device in one of its most useful applications, arranged as a revolving sprinkler for factories.

The New Torpedo Injector.

In our last issue we published a short notice of this injector, which is attracting a good deal of notice, and is made by the New England Machine Company, 43 Beverly street, Boston, the members of which are men of experience in this line of manufacture.

In our previous remarks we quoted a letter from Mr. L. M. Butler, Master Mechanic of the New York, New Haven & Hartford Railroad, at Providence, in which a very good account is given of one of these injectors. We present herewith a sectional view of one of the injectors. It has a wide range; the water supply may be reduced 50 per cent. without interfering with satisfactory working. It may be easily taken apart without any special tools. The vacuum chamber is so reduced that there is little chance for



The "Torpedo" Injector.

sediment to be deposited. The combination and delivery tubes are so arranged that they can be taken out without injury even when used with very bad water. The body of the injector marked *A* in the sectional view has no break in the center requiring bolted connections, and the tubes may all be removed through the openings left by unscrewing the casting at the delivery end and by separating the packing ring *B* from the body of the injector *A*. No special pressure is required upon the packing ring *B* to hold the steam cone 6 upon its seat. All joints around spindles which pass from the outside to the inside of the injector, namely, at the steam lever, the water lever and the overflow are protected by glands. The check valve is caged in the delivery end and held in position by the check ring. One of the strongest claims for this injector is that it may be taken apart when necessary without removing it from the engine. It is said to be particularly well adapted to use with bad water.

The manufacturers consider simplicity, ease of cleaning, range of delivery and prompt and positive action to be the most essential qualifications for a satisfactory injector, and the design illustrated embodies the results of their experience in these directions. Among the special features of this arrangement, and one which will be most appreciated, is that of repairing this injector without deranging piping and connections. It will also be noted that in the construction provision is made whereby the internal tubes separate at the overflow chamber in such a manner as to cause the cones at this point to be drawn out in opposite directions, which obviates trouble from corrosion with waters containing lime.

Perpetual Motion.

"I wondher," said Mr. Dolan, "is it thrue that whiskey'll cure a shnake boit?"

"Av coorse it's thrue," replied his companion.

"And there's no doubt at all about whiskey makin' a man see shnakes?"

"Divil a bit."

"Begob thin!"——

"Phwat's the matter wid yes?"

"Oi've dishcovered perpetual motion!"

Leache's pneumatic sanding apparatus for locomotives is being rapidly adopted by numerous large railroads. During May 83 sets were disposed of to about 19 roads.

The P. & B. "Ruberoid" car roofing is constantly getting more in favor with car builders. It is not a paper roof. It is made from the best of wool and hair felt thoroughly saturated with a water and acid proof composition, and is extremely elastic, and will stand more tear and wear, and racking of a car, the makers say, than any roofing made. It will not become brittle and dry out and tear easily as a paper roofing will.

A Treasure for Tourists.

"Health and Pleasure on America's Greatest Railroad," No. 5, of the Four-Track Series for 1895, issued by the Passenger Department of the New York Central, from the press of the American Bank Note Company, surpasses in size and beauty any volume of like character ever published. No brief description can give an adequate idea of its excellence and utility. To summarize it in a few words, the book is a handsome volume of 504 royal octavo pages, with numerous maps and illustrations, beautifully bound in illuminated covers. The primary object of the book is to give useful information regarding the popular health and pleasure resorts of New York, New England and Canada, but it goes beyond this scope, and in a series of interesting chapters treats of the beauties of landscape and climate to be met with in California, Colorado, Utah, Yellowstone Park, Mexico, Japan and the Hawaiian Islands. The descriptive matter relating to the various features of interest in these localities is accompanied by over 300 illustrations, depicting the most beautiful scenery of the country. In addition to these features, epitomized tables of routes, fares, hotel rates, etc., etc., render the book invaluable to traveler and tourist. The maps are all new and up to date and cover the Adirondack Mountains, Thousand Islands, Lake Region of Central New York and all the prominent resorts.

Every one who intends to travel in the East during the summer should secure a copy of this book and study the 1,000 tours it describes before coming to a decision. George H. Daniels, General Passenger Agent of the New York Central, will send a copy to any address in the world upon receipt of ten 2-cent stamps.

A Forlorn Advertiser.

The accompanying cut is a true likeness of the advertising manager of the Joseph Dixon Company. He is not as cross as he looks, but, whether wisely or not, has spent all the advertising funds allowed him, and is in deep sorrow that his penniless condition will not enable him to accept a million or two of the gilt-edged offers daily presented. He has made all the excuses, quibbles and promises his conscience will permit or his ingenuity can invent. "*Absque argento omnia vana*," which is freely translated in Jersey to mean: "All is vanity when pockets are inside out."

As high grade manufacturers, the Harrisburg Foundry and Machine Works, of Harrisburg, Pa., have gained a well deserved position in the engine and boiler world, and it will be to the direct advantage of all buyers to make themselves familiar with their fine types of engines and boilers.

An Ajax Accomplishment.

The new American line steamship St. Louis made an average speed of 18.37 knots on her maiden trip to Southampton. Considering the fact that the voyage was accomplished without the slightest hitch of any kind, her performance is regarded as eminently satisfactory. All the engine bearings on this new ship are made of Ajax metal, and the results of the first voyage are a very high recommendation of its excellence.

The St. Paul, sister ship to the St. Louis, is also equipped with Ajax metal bearings. This is the same metal that was used in the bearings of the famous New York Central engine No. 999. About 40,000 pounds will be used in the two vessels mentioned. The trial of the St. Louis was so satisfactory that not a stop was made during the run, and there was no indication of heating. Of the many trial trips of which her captain has been in charge this was, he has said, the most satisfactory.

The Boston Belting Company has issued a new catalogue and price list of the numerous mechanical rubber goods it makes. These include every variety of hose, packing, cord, diaphragms, gaskets, mats, tubing, valves, stair and car step treads, etc.

The full-page plate of portraits of prominent American railroad presidents that appeared in the NATIONAL CAR AND LOCOMOTIVE BUILDER for June attracted a great deal of attention, not only on account of the distinguished company it presented, but also because of its high artistic merit and the excellence of the engraving. The credit for this good work is due to the Photo-Engraving Company, of 67-71 Park Place, New York City, who make all the photo-engravings that appear in this paper.

Our Directory

OF OFFICIAL CHANGES IN JUNE.

We note the following changes of officers since our last issue. Information relative to such changes is solicited.

Atchison, Topeka & Santa Fe.—The office of Superintendent of the Western Division is abolished, and its duties are assumed by Charles Dyer, General Superintendent Western Grand Division.

Gulf & Interstate (of Tex.)—Horace M. Dake is appointed Receiver.

International & Great Northern.—The jurisdiction of Master Mechanic F. Huffsmith is extended over the Car Department, succeeding Master Car Builder W. P. Siddons. W. E. Williams is appointed Purchasing Agent, with office at Palestine, Tex.

Mexican National.—Richard Fitzsimmons is appointed Master Mechanic at Santiago, Mex., vice Robert Dewar, resigned.

Mobile & Birmingham.—J. D. Clark is appointed Superintendent and Purchasing Agent, with office at Mobile, Ala.

Monongahela River.—H. G. Bowles is appointed General Manager, with office at Monongah, W. Va.

Morristown & Cumberland Gap.—H. M. Aiken is appointed General Manager, with office at Morristown, Tenn.

New Orleans & Southern.—General Manager G. S. Taylor is appointed Receiver.

Pennsylvania.—Joseph Crawford, Superintendent New York Division, is off on an indefinite leave of absence. He is succeeded by E. F. Brooks, Superintendent Maryland Division of the Philadelphia, Wilmington & Baltimore. Mr. Brooks is succeeded by Wm. N. Bannard, Superintendent of Altoona Division. Robert E. Marshall, Superintendent Motive Power, Philadelphia, Wilmington & Baltimore, succeeds Mr. Bannard, and is in turn succeeded by Clarence Mendenhall.

Santa Fe, Prescott & Phœnix.—Vice-President and General Manager G. W. Vaughn has resigned, and the duties of his office are assumed by President F. M. Murphy.

Seaboard Air Line.—James Maglenn succeeds Wm. T. Reed as Superintendent Motive Power.

Toledo & Ohio Central.—J. E. Brown is appointed Master Mechanic at Corning, O.

Toledo, St. Louis & Kansas City.—Frank Pease succeeds C. E. Walker as Superintendent of Motive Power. Office Frankfort, Ind.

United Counties Railway.—M. Wakefield is appointed Mechanical Superintendent, with office at St. Hyacinthe, Quebec.

Employment.

CAR FOREMAN WANTED.—Small Road. Preferably between 30 and 36 years old. Must have experience in freight and passenger work. Salary, $90.00. State experience. Address Lock Box 0-1, Greenville, Texas.

NATIONAL CAR AND LOCOMOTIVE BUILDER

AUGUST, 1895.

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The Northern Pacific is building 100 box cars at its Edison shops.

The Pennsylvania Railroad is building 18 new engines at its Altoona shops.

The "Big Four" is reported as about to order a large number of box cars.

The Philadelphia & Reading is reported to be about to order 1,000 freight cars.

The Cleveland, Lorain & Wheeling is in the market for between 500 and 1,000 coal cars.

The Augusta Southern has ordered six passenger cars from the Ohio Falls Car Company.

The Atchison, Topeka & Santa Fe has increased the force of men at all its car shops in Kansas.

The Chicago, Burlington & Quincy is building at its different shops about 25 new locomotives.

The Delta Construction Company, of New Orleans, La. is in the market for three mogul locomotives.

Street cars to be operated by compressed air are to be tried shortly on the Ninth avenue line in New York City.

The York Southern (of Pa.) has ordered a freight engine and two passenger engines of the Baldwin Locomotive Works.

The Otis Steel Company, of Cleveland, O., has increased the wages of its 800 employés 10 per cent., beginning July 1.

The Calumet & Blue Island is about to order 200 box cars, to be equipped with air-brakes and automatic couplers.

The Pittsburgh, Akron & Western has awarded a contract to the Brooks Locomotive Works for building four locomotives.

The Southern Pacific is to build a hospital at Oakland Cal. It is to be paid for out of the hospital fund, which is sustained by the employees.

It is reported that the Mobile & Birmingham Railroad will shortly begin the erection of repair shops and a roundhouse at Mobile, Ala.

The Chicago, Milwaukee & St. Paul is using corncobs saturated with coal oil in several of its roundhouses for kindling fires in locomotives.

The Rogers Locomotive Company are finishing four compound engines for the Chili State roads. They will be ready for shipment about Aug. 15.

The Queen & Crescent Company has placed an order with the Ohio Falls Car Company for 200 box cars to replace vacant numbers, and 52 flat cars.

The Lake Shore & Michigan Southern has ordered 500 box cars—250 from the Wells & French Car Company and 250 from the Michigan Peninsular Car Company.

The Davenport, Clinton & Eastern will shortly order four first-class passenger cars, 20 box cars, 20 platform or coal cars, two combination cars and two cabooses.

The Merchants' Despatch Transportation Company will move its shops from Rochester to Depew, N. Y., where an extensive new plant will be erected, it is said, within four months.

The Baldwin Locomotive Works have an order for six locomotives for shipment to Japan. This makes a total of 50 locomotives built by the Baldwin people for Japanese railways.

The Concord and Montreal stockholders have ratified the lease by the Boston and Maine, of the Concord and Montreal, and the increase of the capital stock of the latter by $1,200,000.

The Wisconsin & Michigan has just placed an order with the United States Car Company, for 250 box cars, of 60,000 lbs. capacity. An order for an additional 250 cars will be given shortly.

The Augusta Southern has ordered six passenger cars of the Ohio Falls Car Company. The Durham Lumber Company, of Durham, Ala., is having some logging cars built at the same place.

The Brooks Locomotive Works are building 18 new engines for the Great Northern Railway, all of which are to be equipped with the New York Air Brake Company's engine and tender equipment.

The Lake Shore & Michigan Southern has awarded the contract for 30 ten-wheel locomotives to three shops, as follows: To the Schenectady Works, 10: to the Pittsburgh Works, 10, and to the Brooks Works, 10.

The Kansas City, Pittsburgh & Gulf has ordered three day cars, three chair cars and three baggage cars from the Barney & Smith Company. They will be finished inside in oak and will have Pintsch gas lamps.

Orders issued by the Third Vice-President of the Southern Railway directs all heads of departments on that road to discharge or transfer all men in their departments related to themselves, either by blood or marriage.

The gross earnings of all lines of the Santa Fe system for May were $3,279,042; for the same period last year, $3,224,281; increase, $54,660; net earnings for May, 1895, $665,551; for the same period last year, $520,703; increase, $144,847.

A Philadelphia street-car company has started the running of special "trolley-party" cars on which ice cream and other refreshments are served, musicians are carried and a brilliant and many-colored electric illumination is maintained.

The Wheeling & Lake Erie has been building 150 30-ton capacity coal cars that weigh but 24,000. Nearly all the castings are of malleable iron, and malleable iron castings are substituted on all cars rebuilt or having general repairs on this road.

The Gilbert Car Works, of Troy, N. Y., were sold at auction July 2 for $72,000, to representatives of the Atlantic Trust Company, of New York, which held a mortgage amounting to $79,000 on the plant. The estimated value of the works is $400,000.

The Wisconsin & Michigan Railroad Company is in the market for 500 box cars, 34 feet long, of 60,000 lbs. capacity, to be used in connection with the Lake Michigan Car Ferry Transportation Company, between South Chicago and Peshtigo Harbor, Wis.

The Beech Creek Railroad has ordered 1,000 hopper bottom gondola cars, divided as follows: 250 of Murray, Dougal & Company, of Milton, Pa.; 250 of the Buffalo Car Manufacturing Company, of Buffalo, N. Y., and 500 of the Union Car Company, of Depew, N. Y.

It is stated that the Grant Locomotive works at Chicago will, under the control of the Siemens-Halske Electric Company, be devoted to various industries, and that besides the manufacture of electrical equipment they will compete with other concerns in the building of locomotives.

The Dickson Manufacturing Company, of Scranton, Pa., is completing three large locomotives for the Delaware & Hudson. These locomotives are hard-coal burners. They have 19 by 24 inch cylinders, a 60-inch boiler, and carry 180 pounds steam pressure, and weigh 120,000 pounds.

The Philadelphia Traction Company is building a number of mail cars designed in accordance with the suggestions of the United States Post Office authorities. One half of each of the new cars will be used for assorting the mail, accommodation being provided in the other half for passengers.

Clocks have been placed on the outsides of the locomotives on the Paris, Lyons & Mediterranean Railway Company. They are fixed on the side of the engine, facing toward the station platforms, for the benefit of both passengers and station agents who wish to note the instant of arrival and departure of the trains.

Recent small orders of the Brooks Works include a 17 by 24 inch six-wheel switching engine for the Johnson Steel Company, of Cleveland, this engine having been in stock. A special switching locomotive for Corrigan & McKenny, of Cleveland, designed for service at their iron furnaces, is now being built at Dunkirk.

It is said that Mr. Wm. Buchanan, Superintendent of Motive Power of the New York Central, is going to keep some special records of the Empire State Express engines by weighing their moving parts before they leave the shop and again when they return, also by weighing them before and after coaling each trip.

The Chicago, Rock Island & Pacific has ordered five 10-wheel engines from the Brooks Locomotive Works of Dunkirk, N. Y. The specifications call for cylinders 19 by 24 inches. The boilers will be 60 inches in diameter and will carry 180 lbs. steam pressure. This road has also ordered 200 freight cars with rigid trucks of the Michigan Peninsular Car Company.

The Baldwin Locomotive Works are building four compound locomotives for the State railroads of Chili; two 10-wheel freight engines and two 8-wheel passenger engines. In addition to these the Baldwin works are building ten 18 by 20-inch cylinder 8-wheel passenger locomotives for the Missouri Pacific, and five consolidation freight locomotives for the Buffalo & Susquehanna.

The West India Improvement Company has ordered from the Jackson & Sharp Company, Wilmington, Del., two passenger cars for shipment to the Jamaica Railway, West Indies. This same company has ordered four compound 10-wheel engines of the Rogers Locomotive Company. They are to work in freight and passenger service, and have cylinders 20 inches and 31 by 26 inches.

About the last item of interest to be published concerning the A. R. U. strike of July, 1894, are the facts that it is decided that Debs' two terms of six months each in jail may be served simultaneously; and that the District Attorney at San Francisco has withdrawn all the suits against the railroad strikers and rioters of 1894 that were pending in the United States District Court for California. Over 100 men were let off.

The Pennsylvania Railroad has ordered 250 hopper bottom gondola cars of the Michigan-Peninsular Company. They are to be of 70,000 lbs., capacity, and will have Schoen pressed steel bolsters and side bearings, National Hollow brake beams and Westinghouse brakes. The same road has ordered 300 box cars of the Ohio Falls Car Company, and 200 of the St. Charles Car Company. They will be of 30 tons capacity.

An Ohio man recently came nearer than anyone has ever done to having a collision of locomotives simply as a show. He secured an enclosure near Canton, O., and two old engines, which he painted white, and lettered them *Protection* and *Free Trade* respectively. They would have been turned loose on each other, but the gate money only amounted to $2,000, and this was not enough to pay for the engines. The admission money was refunded to the would-be spectators, and they went away disappointed and angry.

The new shops of the Cleveland, Cincinnati, St. Louis & Chicago at Wabash, Ind., will be completed by November 1. The plant is quite extensive, and consists of an erecting shop, 60 by 160 feet; a machine shop, 60 by 99 feet; boiler, blacksmith and wood shops, each 60 by 79 feet 5½ inches; a tin shop, 23 feet 11 inches by 38 feet 11 inches; boiler and engine room, 35 by 38 feet 11 inches; an office, 37 feet 5 inches by 22 feet 10 inches; a transfer table, a 15-stall roundhouse, freight car repair shop, sand house, oil and storerooms, etc.

The $5,000,000 loan just placed in London by the Pennsylvania Railroad Company will be used for various purposes of improvement, about half east and half west of Pittsburgh. Among the objects mentioned are the new bridge over the Delaware at Frankford ($1,500,000), abolition of grade crossings on the road to New York, a new bridge over the Ohio at Cincinnati, a new union depot at Dayton, O., widening tunnels on the Panhandle road, etc. Another expenditure is to be made in the building of 1,500 freight cars to meet the demand for lake iron and ore and coal traffic.

The Baldwin Locomotive Works are building a 19 by 26-inch passenger engine for the C., B. & Q., to carry 200 pounds steam pressure and have piston valves, and a trailing truck behind the drivers. It will be a simple engine and is for the purpose of hauling a train of six cars from Chicago to Galesburg, 163 miles, in three hours, or at an average speed of 54.3 miles per hour. The grate area is to be large and the locomotive will be very powerful. This engine is the outcome of the competition between the Burlington and the Northwestern in mail and fast passenger service.

General Manager Doddridge, of the Missouri Pacific, says that during a recent trip through the Southwestern States he was surprised to see the advanced and abundant condition of the corn crop therein. He says Texas has the largest corn crop growing that it ever produced.

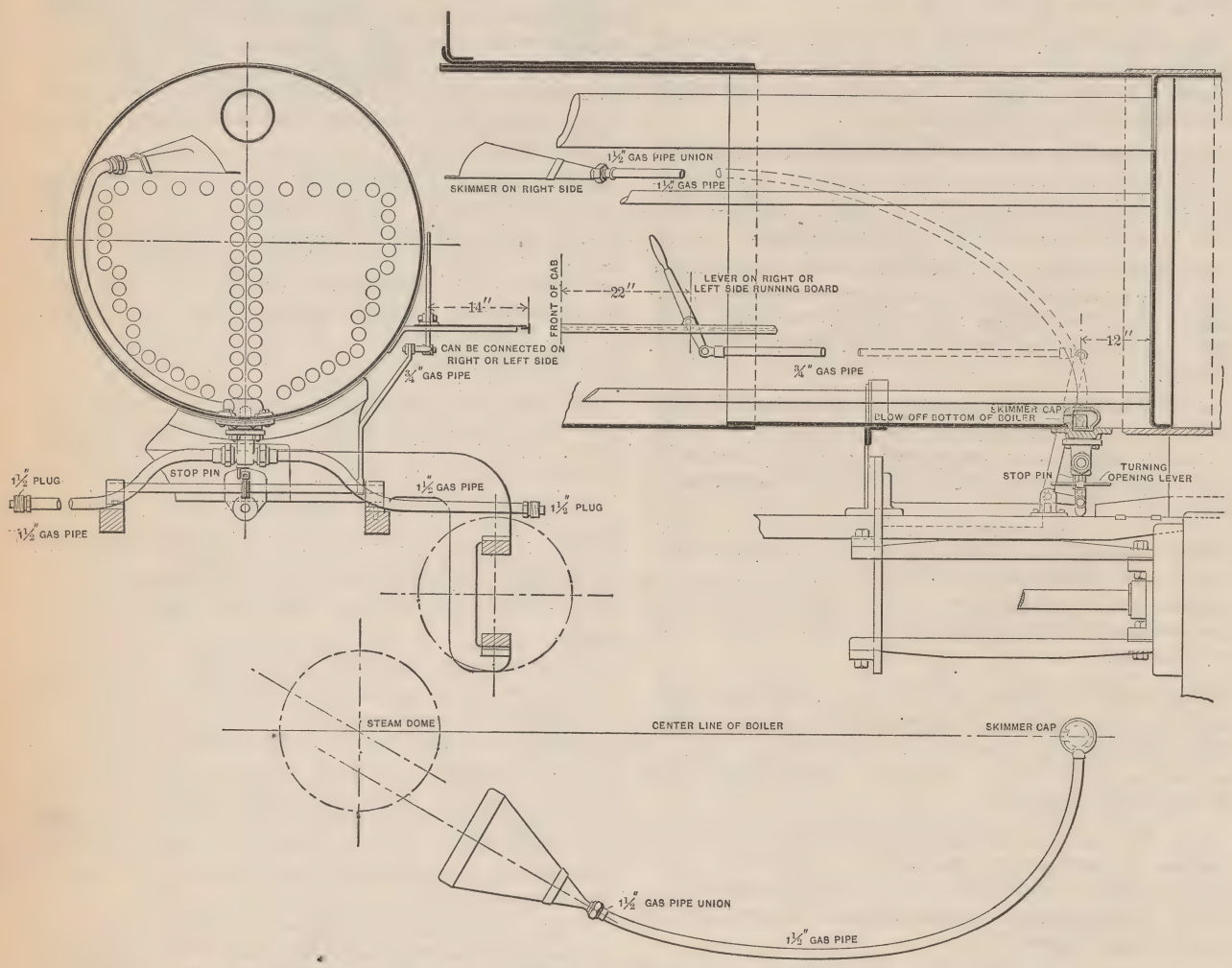
Employees of the Boston & Maine have received the following circular, signed by the superintendents and approved by the general manager: "Your attention is called to the fact that you are not allowed to use tobacco in any form whatever while on duty, nor on trains or in stations when off duty with uniform or badge on. This rule is imperative, and must be regarded at all times."

Improved Blow-off Cock and Skimming Arrangement.

The engravings presented herewith reproduce drawings kindly furnished us by Mr. D. Hawksworth, Superintendent of Motive Power of the Burlington & Missouri River Railroad in Nebraska, and show the general arrangement and detail construction of an improved blow-off cock, and arrangement for skimming the impurities from the surface of the water in the boiler before these have time to settle and adhere to the internal parts. The water used for locomotives on this road contains a great deal of alkali and other incrusting matter, and it has been usual to have to wash the boilers out after about every 500 miles run. By the improved arrangement here illustrated it has been found possible to get rid of so much of the water's impurities while steam is on the boiler that washing out is necessary only after 1,800 miles have been run, thus reducing the frequency of washing out to one-sixth of the number of times formerly necessary. This not only saves the labor involved and a considerable amount of fuel, but reduces in a very important degree the destructive action of expansion and contraction of the boiler when being cooled and washed and again "fired up."

The arrangement is so simple in construction and so plainly shown in the drawings that a description would simply repeat what is more plainly presented therein. The apparatus is arranged to be operated by a lever, as shown, from the running board in front of the cab, where at the will of the engineer either the skimmer or blow-off cock can be operated by turning the valve a quarter of a turn around by means of the arm attached to the stem. This opens the blow-off cock to either the skimmer or the bottom of the boiler. The mud can be blown either to the right or to the left according as the direction of the wind or other circumstances may make desirable. The practice is to operate the blow-off cock (blowing the mud from the bottom of the boiler) only at division points, and to operate the skimmer while on the road whenever necessary, the valve being usually set for skimming before the engine starts on the trip.

One of our engravings shows the general arrangement of the device, and the other shows the detail construction of the valve on an enlarged scale. There is no patent on the device.



Blowoff Cock and Skinning Arrangements, Burlington & Missouri River Railroad.

New Railroad Legislation.

A new law adopted by New Jersey provides that whenever an electric line wishes to cross an existing railroad, outside the limits of cities, the Chancellor of the State, on application, must define the manner of crossing and order a separation of grades if he deems it practicable and necessary for the public safety.

New laws adopted in Michigan provide that gates at crossings of railroads and highways are to be erected whenever the State Railroad Commissioner deems it necessary. Failure to lower a gate at the proper time is punishable by fine and imprisonment. It is made the duty of railroad companies to provide a blackboard at every passenger depot on its line, for the purpose of bulletining all passenger trains. Such bulletining must appear at least 20 minutes before the actual schedule time for the arrival of such passenger train, giving the station at which the train then is, and if late how late, and such other information as would be of benefit to the traveling public. A penalty of $25 and costs is attached for violation of the act.

The Western Outlook.

President Clark, of the Union Pacific, in speaking recently of the business conditions in the Eastern and Western States, said that indications pointed to an upward tendency in the stocks of the Western roads, for the reason that if all the present conditions were realized a tremendous grain crop would have to be moved this fall. "From the East come cheering words of healthier business conditions," he continued. "The manufacturers of steel rails, steel plates and other railroad supplies are putting on increased forces and running to full capacity. This is a hopeful sign, and maybe we are at the turning of the tide which will bring us renewed prosperity. Here in the West we can hardly hope for any material change until the crops are garnered, for we are essentially an agricultural people, but the East, which reflects the prevailing sentiment of the country, shows stronger hopes for the future than for two years past, and we cannot help but benefit from this change in economic ideas even though indirectly."

Railroad Development in Russia.

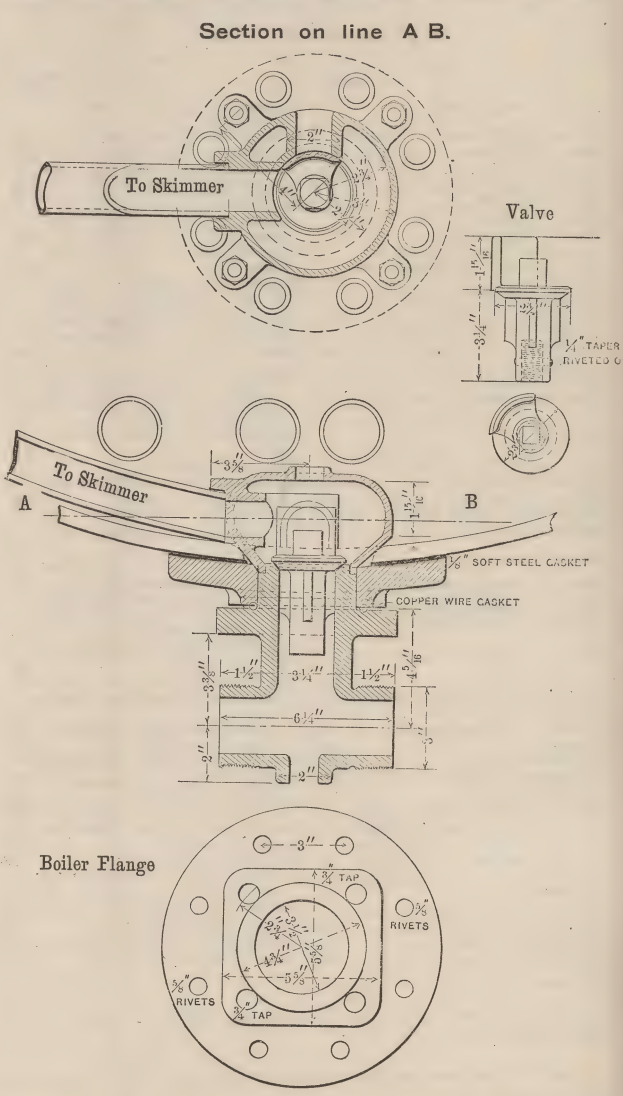
Our English contemporary, the *Railway Engineer*, says that according to recent advices from St. Petersburg the superintendence of the works of the Siberian Railway is about to be entrusted to a special official invested with extensive powers. He will have the title of Assistant to the Minister of Ways and Communications, and will personally supervise the construction of the line. A group of Belgian capitalists is at present negotiating with the Russian Government to obtain a concession to build a railway to connect the Caucasian system with the Transcaspian lines. The route of the proposed new line would be along the shores of the Persian Gulf. The special committee which was sent by the Russian Railway Administration to Great Britain, France, Germany, Switzerland, Holland and Belgium to study the electric railways and latest improvements in electric transit in those countries has just returned to Russia. M. Gortschakov, the engineer, who is president of the committee, has submitted a detailed report to the Emperor on electric locomotives and the English electric brake. His Majesty endorsed on the report, in his own hand, the following remark: "Very interesting, and desirable to be introduced in Russia, taking the English railways as models."

On July 3, the Boies Steel Car Wheel Works, of Scranton, Pa., employing 200 men, advanced wages 10 per cent., to go into effect from July 1. The works are crowded with orders.

A bicycle ride of 1,385 miles from Jacksonville, Fla., to Chicago, was recently completed in 15 days, an average of over 92.3 miles per day. The ride was accomplished by Mr. P. Burritt, on an 18-pound bicycle. He carried 25 pounds of baggage, and, it is said, gained 12 pounds in weight during the trip.

Through a Bridge.

A distressing accident happened on the Santa Fe road July 17, killing three persons, fatally injuring three and seriously injuring 15 others. A bridge near Monument, Colo., fell beneath a passing freight train. The bridge gang, consisting of 20 men, were working under the north end of the bridge. The train passed over them and was nearing the other side when the timbers gave way and the train went through into a gulch 50 feet below. The wife of one of the workmen was sitting on a ledge of rock watching the men at work when the timbers began to crack, and another workman, who was on the structure, jumped to save her. The leap was fatal, as he had scarcely reached her side when the great mass of wreckage fell upon them.



The City Council of Norfolk, Va., has agreed upon terms by which property desired by the Southern Railway for terminal facilities will be leased to that company for a period of 30 years, renewable forever at the option of the company. The company is to pay annually a rent of $1 and taxes. It is to establish at Norfolk a deep-water terminus and give to that city freight rates as favorable as are given to and from Portsmouth and Richmond.

The New York & Pennsylvania Railroad Company was incorporated at Albany, N. Y., July 22. It is to build a steam road 30 miles long to connect Hornellsville and Willing, N. Y. The capital is $300,000, and among the directors are Messrs. William Richman and B. M. Connell, of Hornellsville. The company's principal office will be in Hornellsville.

The earnings of the Chicago, Milwaukee & St. Paul Railroad for the second week in July were $503,077; for the same period in 1894, $322,707; increase, $180,370

Trunk wires to connect London by telephone with Edinburgh, Glasgow, and Dublin have just been erected by the British post office.

Baggage is moved from one end to the other of the Victoria station, at Manchester, in basket-trucks running along a light electric railroad suspended from the roof of the station. The trucks are lowered by chains to any platform desired.

At the meeting of the stockholders of the Decatur & Southeastern and the Indiana & Western railways July 16 these roads were consolidated under the name of the Indianapolis, Decatur & Western Railway Company.

A correspondent of the New York *Tribune* says that he recently found 20 well built towns in Kansas without a single inhabitant. One of them, named Saratoga, has a $30,000 opera house, a $20,000 school house and a substantial brick hotel, which now gives shelter to coyotes, bats and owls. All these deserted towns were built by speculators in the boom days.

Locomotive Repair Shop Equipment.—V.

BY W. H. WESTON, M. E.

(*Continued from page* 101, NATIONAL CAR AND LOCOMOTIVE BUILDER *for July.*)

The matter of erecting shop equipment is one on which there can be something said, because there has been a tendency in many places to take it for granted that this part of a shop does not need any equipment in the way of facilitating work. Or at all events it would seem as if this was the case by the appearance of many of the repair shops around the country. It is hardly the place in this article to consider the shape or size of a shop, yet this is the point of first consideration. Small and badly arranged erecting departments result in such inefficiency that when an engine is stripped everything is mixed up promiscuously simply because there is no other way of doing under such conditions. And the result is that things are continually in the way, and nearly every piece must be handled over at least twice as often as will be necessary in the shops that are well arranged. This restriction of space to work in, and the handling of parts, all costs money, and in some cases a large amount for which there is no equivalent in the way of repairs done; there being no doubt but that in many instances the erecting department work costs at least 25 per cent. more than it would if there was an efficent and systematic equipment and arrangement. This may seem rather a strong statement, yet it is absolutely the case many times, and there may be instances where the percentage is still larger than this.

Under such conditions it is evident that the money spent in this way in a year or so would supply the department with a very effiicent equipment, and afterward it would all be clear gain. On a road where the money could not be had to put in a proper equipment all at once, it will be advantageous to make a start, at least, and procure whatever can be had, even if it is a little at a time. By so doing, if it is carried out in a careful and systematic order, much can be done toward securing an efficient shop. But in many places, because the whole amount of money required cannot be had all at once, there is no attempt made to improve the facilities for repairs. And thus the old and costly ways of running are kept going year after year.

To start with the consideration of equipment for this department, lifting gear may be taken first. Of course an overhead traveling crane capable of lifting an engine is a valuable machine in building works, and in very large and extensive repair shops, but in shops of small or moderate size it may not be advisable to use one for the reason that a crane for such a place must be of the same capacity as it would have to be for the most extensive works, and consequently would cost just as much. And as they are expensive to install, it is probable that, everything considered, it is not economy to use them except in large plants. As it is not the purpose of this article to specially consider the very large shops, other means of lifting gear will be mentioned. These are hydraulic and screw jacks, and in regard to them it can be said that the best that it is possible to make are none too good, and nothing but the very best that are on the market should ever be bought for any shop, whether large or small. For, in the first place, if inferior ones are used they are not reliable and such a thing as an engine tipped over may be the result; and next, they require much time and money spent in the attempt to keep them in usable condition. Consequently, if after a trial with a certain kind they are found to be unsatisfactory, it is much cheaper to throw them away and substitute whatever form may have been found superior to them.

In shops that are of such form as to allow of it, a hoisting gear run by power is to be recommended, as by this means engines can be unwheeled and wheeled very readily. Such an arrangement is not expensive and can be built at the shop. Its simplicity recommends it, as a drum on which runs a heavy chain, together with posting and trussing of sufficient strength to hold the weight, forms the principal part of the mechanism. The power being supplied to the drum by belt through intermediate gears or worms, if the hoist is properly planned and the gearing well made, and the whole solidly put together, it will be a most satisfactory machine.

Another arrangement that facilitates work around an engine very materially is an overhead tram-rail over each pit, so that by connecting a small hoist to it, casings, smokestacks, frames, cylinders, etc., can be readily handled. Such an arrangement over each engine does not cost much and is of great advantage, and it is one that should be used in all shops.

Drill presses should be placed liberally throughout an erecting department, because it is often necessary to make use of them, and there is no economy in having to travel all over a shop in order to find an empty press whenever one is wanted. A point of importance is to so locate these that they will be readily available and yet not be in the way of the erecting work, the shape of the building of course having much to do with the matter. Radial drills are also important in an erecting department, and they should be supplied according to the size of the shop, even a small shop requiring at least one of them to be fully equipped.

Portable power machines should be supplied in all shops for drilling, boring, etc., compressed air being the best means of operation. Although belting is used to considerable extent it is not very satisfactory, because it is rather awkward to handle and does not give so reliable and uniform a power, and is very apt to be more or less in the way while in operation. As to the advantages of compressed air, it is cheap, reliable, clean, quickly put in operation at any point, perfectly safe, occupies but small space; and it is a power that can readily be had at any railroad shop, for it is a simple matter to set up the necessary Westinghouse pumps and reservoirs and a suitable line of piping around the erecting department, with properly located valves and connections for the hose.

In regard to the use of electricity for portable power, there are many objections to it, and there is no excuse for its employment. The disadvantages are that it is expensive to install and expensive to operate, and repairs are constant. It is in no way reliable, is not a uniform power, is highly dangerous, is dirty, and requires the strictest attendance to keep it running. If a motive power superintendent finds any shop in possession of an electric motor, the best thing that he can do is to either throw it into the dump or else wrap it up in cotton batting and send it back to the concern that made it and tell them to sell it over again to some who has money to waste.

In the matter of cylinder-boring machines and valve-seat facing machines there has been a great tendency to make them too light, and the result is that they are generally rather unsatisfactory to operate and in the work done. It would be a great improvement to have these heavy and solid throughout their construction. In this way the work could not only be done quicker, but it would be much better. When a cylinder is to be rebored it should be accurately done, yet many times, with common machines, they will spring under the heavy side cuts, and the result is that when the work is completed the cylinder will not be perfectly round, and in some cases it is hard to keep the machine in line and the feed regular.

Portable and fixed benches with vises should be well supplied, as a means of expediting the work of the department. Another point of importance is to have a good-sized space fitted up for the building of new trucks and the repair of old ones. All truck work should be done here, as far as possible. This separates it from the other work and also allows a chance to secure better facilities for its performance than where it is done at the same pit on which the engine stands, or on whatever track may happen to be vacant at the time the work is commenced and then moved around as the tracks are wanted. The equipment of this department depends somewhat on the size of the repair shops, but should always include drill presses, and, in some cases, possibly a small planer and a lathe, a grind stone and emery wheel. A portable power and flexible shaft for drilling is often of much advantage in repairs.

Another point for consideration is to have a suitable part of the shop given to work on tender air-brakes. On a road of any size there is considerable of this work needed and a suitable place for it is advantageous. The value of having the truck and brake work by themselves, instead of having them mixed up in a tangle with everything else, should be easily appreciated. As to the matter of small tools, they should be supplied to the fullest extent by a proper tool room, these having been mentioned in the article on tool-room equipment.

Traveling Engineers' Association Ciculars.

The following circulars have been issued by the Traveling Engineers' Association relative to subjects being investigated by its committees, and to be reported on at the next convention:

Smoke Prevention.

A committee of the Traveling Engineers' Association appointed to enquire "How can the Traveling Engineer assist in preventing the unnecessary emission of black smoke," desires answers to the following questions:

1. Do you recommend the use of a smoke consumer? If so, please say what one.
2. Are as good results obtained with the diamond stack as are with the straight stack and extension front in the prevention of black smoke?
3. What quality of coal in your opinion gives the best results when the prevention of smoke in an object?
4. Do you recommend the use of brick arches? If so, please give reasons.
5. Do you consider it good practice to wet the coal? If so, please say to what extent.
6. In your opinion is a light fire or a heavy one the most desirable for the prevention of black smoke?
7. Can the engineer assist the fireman in the prevention of smoke? If so, please say how.
8. Can the smoke nuisance be brought to a minimum by the effects of skillful and intelligent enginemen without the use of a smoke consumer?
9. What appliances do you use, if any, to prevent black smoke?
10. What has been your experience with brick arches and baffle plates over the furnace door inside of the firebox?
11. If any appliances are used successfully, is it entirely due to the appliance, or to the skillful handling of the same by the enginemen?
12. When engines are double crewed or pooled, do you find any difference in the amount of black smoke emitted by different crews on the same engine?

Any other information that any member can give, which in their opinion would tend to be of value in getting out this report, should be added to the questions propounded by your committee.

D. R. MCBAIN, 410 West Franklin Street, Jackson, Mich.; C. F. SCHRAAG; A. M. BICKEL; C. M. BRINSLEY.

Tools for Engines.

The committee on the subject for discussion at next annual meeting, viz.: "What is the smallest list of tools, arranged in the order of their importance, that traveling engineers would recommend be carried on engines, and what now carried can be dispensed with?" desire replies to the following questions; and any other information relative to the subject will be thankfully received:

What is the smallest list of tools you would recommend be carried on an engine?

Please furnish list of tools your company provides.

What tools now carried could with safety be dispensed with?

Do you consider it necessary to carry more tools on engines located away from shop than on those which come to the shop daily? If so, why?

CHAS. DAVIS, 352 N. Division St., Buffalo, N. Y., GEO. W. O'NEAL, F. A. MCGUIRE, N. W. SHAW, C. A. DIXON.

Record of Engines.

The committee on the subject for discussion at the next annual meeting, viz.: "In what manner can a close record be kept of condition of engines, amount of work performed and manner of doing it, together with manner in which their work is done by engineer and fireman, which will serve as a record of character and qualification for advancement of men?" desire answers to the following questions:

Can a closer record be kept than that possible to be shown by the inclosed "Traveling Engineer's Report," whereby the reverse side shows under the column "Engineer" the manner in which he inspects, oils and runs the engine, also her condition, for which he is directly responsible?

"Fireman," his system of firing, cleanliness and general condition, for which he is responsible?

General Condition.—This covers all defects pertaining to wheels, bearings, valves, machinery, firebox and boiler, the seriousness of their condition to be determined by the figures "1" to "5" being placed in the narrow column to the left of "Remarks."

The records also of "Engineer and Fireman" to be determined by these figures in their column, which thereafter are transcribed into a record book kept in the office for that purpose.

Advise the committee what suggestions you can offer, or changes that can be made to make the form more complete in detail, etc.

J. H. LITTLE, 1052 Washington Boulevard, Chicago, Ill.; J. H. BURNS, P. MENSER, M. W. BURKE, JAMES FITZMORRIS.

A. B. & C. RY.

TRAVELING ENGINEER'S REPORT
OF CONDITIONS OF

Engine No.....
Running on.....Div.
Between.....
And.....
In.....Service.
.....189....
.....Eng'r.
.....Fireman.

1. Very Good,
2. Good.
3. Medium.
4. Poor.
5. Very Poor.

Trav. Engineer.

		REMARKS.
Engineer.	Inspection	
	Oiling	
	Running	
	Cond. of Engine	
Fireman.		
	Firing	
	Cleanliness	
	Cond. of Engine	
Gen'l Cond.		
	Wheels and Bearings	
	Valves	
	Machinery	
	Fire-Box and Boiler	

Note.—This form as proposed is 8.5 inches long, printed on opposite sides.—ED.

Future of the New England Railroad.

The Hartford *Post* of July 23 prints a statement, said to be from authentic sources, that the New York, New Haven & Hartford Railroad will assume control of the New York and New England property on September 1, and that within one year the "Consolidated," with all the branch lines and the property of the present New York and New England road, will be renamed the New England Railroad Company. It is asserted that the "Consolidated" now owns 55 per cent. of the stock of the New England.

Liberty Bell will be taken to the Atlanta Exposition. The Pennsylvania Railroad will build a special car for its transportation similar to that which carried the bell to Chicago two years ago.

Mrs. Catherine O'Leary died July 3. She was the owner of the fractious cow that, on a memorable night in October, 1871, kicked over a lamp and started a blaze which cost Chicago $190,000,000.

Electric Motor Cars for the Pennsylvania Railroad.

The photo-engravings on this page show exterior and interior views of one of several electric cars built for the Burlington & Mt. Holly branch of the Pennsylvania Railroad by the Jackson & Sharp Company, of Wilmington, Del. As will be observed, the cars are of an exceedingly neat and attractive design and have closed vestibule ends with side doors. In construction they are similar to the Pennsylvania Railroad standard coach, but are smaller. The length of the car body in the frame is 35 feet, the length over the platforms being 43 feet 6 inches. The width of the car at the sills is 9 feet 4 inches.

It is the intention of the railroad company to haul regular passenger coaches as trailers, hence the motor cars are equipped with the standard Janney platforms, couplers and buffers and have an end entrance for passage from one car to the other. The side windows are made to hoist as in the regular steam coaches, and the deck sashes are fitted with the Manhattan patent openers, operated by levers from the end of the cars. These open alternate sashes in the reverse direction, so that ventilation is effected by moving these levers according to the direction of the car.

The interior finish is of Mexican mahogany, light in color, and the side and top ceilings are of handsomely figured white birch veneer, highly polished, but without a line of decoration. The beauty of the car, therefore, aside from the delicate carvings and fancy moldings, is in the figure of the woods employed, and the excellent finish they have received. The seats are of the Bushnell type, with their patent reversible fixtures and tilting cushions. They are upholstered in the finest crimson plush, but, as will be noticed in the interior view, they are not fitted with the usual side arms. This is quite a novel feature, and one that is bound to prove attractive to the traveling public. It affords more comfort and gives more room.

The lighting is to be by electricity, with incandescent lamps ranged along each side of the roof. Auxiliary fixtures are provided in the center, as shown, for burning oil in case the current should give out. The curtains to the side windows are held in place by McKay patent fixtures, which consist of a small revolving shaft on the bottom, with a gear wheel on each end running in brass racks in the window groove.

The trucks are of the Jackson & Sharp Company's standard type, made to conform to the Pennsylvania Railroad's standard requirements as to pedestals, boxes, journals, brasses, etc. The wheels are 36 inches in diameter, and a part of them were furnished by the Allen Paper Car Wheel Company, and a part by the Standard Car Wheel Company. The axles, motor-supports and other parts are designed to carry Westinghouse 75 horse-power motors, two to each car, although the first car was equipped with four 50 horse-power motors. Attached to the front part of each truck there is a light iron fender made on the same principle as the ordinary locomotive pilot. This is intended as a safeguard and to prevent a derailment of the train, and is provided to remove all obstacles from the track.

The baggage compartment in these cars is finished in the usual manner, so that baggage, express and marketing can be conveniently handled, but there are also side seats with a hinged section to cover the space of the side doors, and these are designed for the use of smokers, so that practically it may be termed a combination smoking, baggage and passenger car. The trial trips of these cars have proven highly successful and a high rate of speed has been developed, even beyond the expectations of the railroad officials.

The branch line on which these cars run is 7 miles long and extends from Burlington to Mount Holly, N. J. The fare is 10 cents each way and 10 trains are run each way on week days and 9 on Sundays. Its motive power has previously been steam locomotives and one train a day is still hauled in this way. The electric service began July 22.

Electric Motor Car Mt. Holly Branch, Pennsylvania Railroad.

Interior View of New Electric Car for the Pennsylvania Railroad.

End View, Mt. Holly Branch Electric Car.

A Pin Machine.

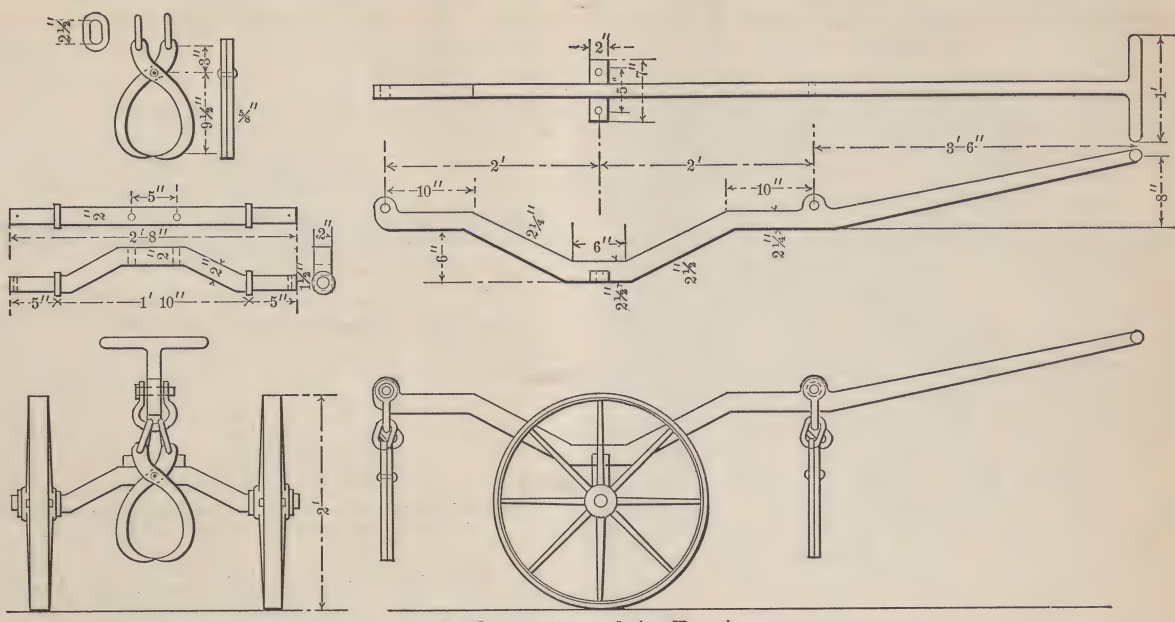
Among the operative exhibits that will be shown in Machinery Hall at the Cotton States and International Exposition is a pin machine. It is in two parts, the first of which makes pins and the second sticks them in paper. This will be done in full view of the visitors. A slender thread of brass wire is started in one end of the machine. It is cut, pointed and the head put on, and the completed pin is dropped into a bath which plates it with white metal. From this receptacle the pins are dropped into a sifter, which carries them rapidly to the sticking machine, where they are stuck in regular rows in the paper, and a complete paper of pins is turned out. The mechanism of the machinery is delicately elaborate, and it will be one of the most interesting exhibits in the Machinery Hall.

The Moberly Shops of the Wabash Railroad.

Among the best managed railroad shops that it has been the writer's good fortune to visit recently are those of the Wabash Railroad at Moberly, Mo., in charge of Mr. Thomas E. Butterly, Master Mechanic of the Western division of the Wabash. The company owns about 130 acres of land at this point, so there is ample room for the extensive yards and shops necessary for handling the traffic on this division and keeping the rolling stock in order. This division is what was formerly the old North Missouri Railroad, and later the St. Louis, Kansas City & Northern, and much of the old rolling stock that formerly bore those names is still in service under the banner of the Wabash. Here the writer saw some of the first locomotives he ever had the temerity and opportunity to mount. One of these is specially memorable as being the first he ever rode a foot

on. On that occasion he met one of the greatest surprises of his life when he saw the engineer pull the throttle lever *backward* to make the engine go *forward*. That, then, seemed an irreconcilable movement. That was in the old North Missouri days. Mr. Butterly was on the road then as a fireman. He afterward rose through the different grades of locomotive engineering to be, under the early Wabash management, the Traveling Engineer of the division, and later its Master Mechanic. As may be expected, he is very much at home in his work. Being a painstaking man this is thoroughly well done, the fact of it being so being attested by the condition of the shops, the locomotives, and by the excellent personnel of the engineers and firemen. Mr. Butterly is ably assisted in the management of the shops by his General Foreman, Mr. Garret Vliet, whose special fitness for the position may be understood when it is known that he is a graduate of the drafting room as well as of the shop.

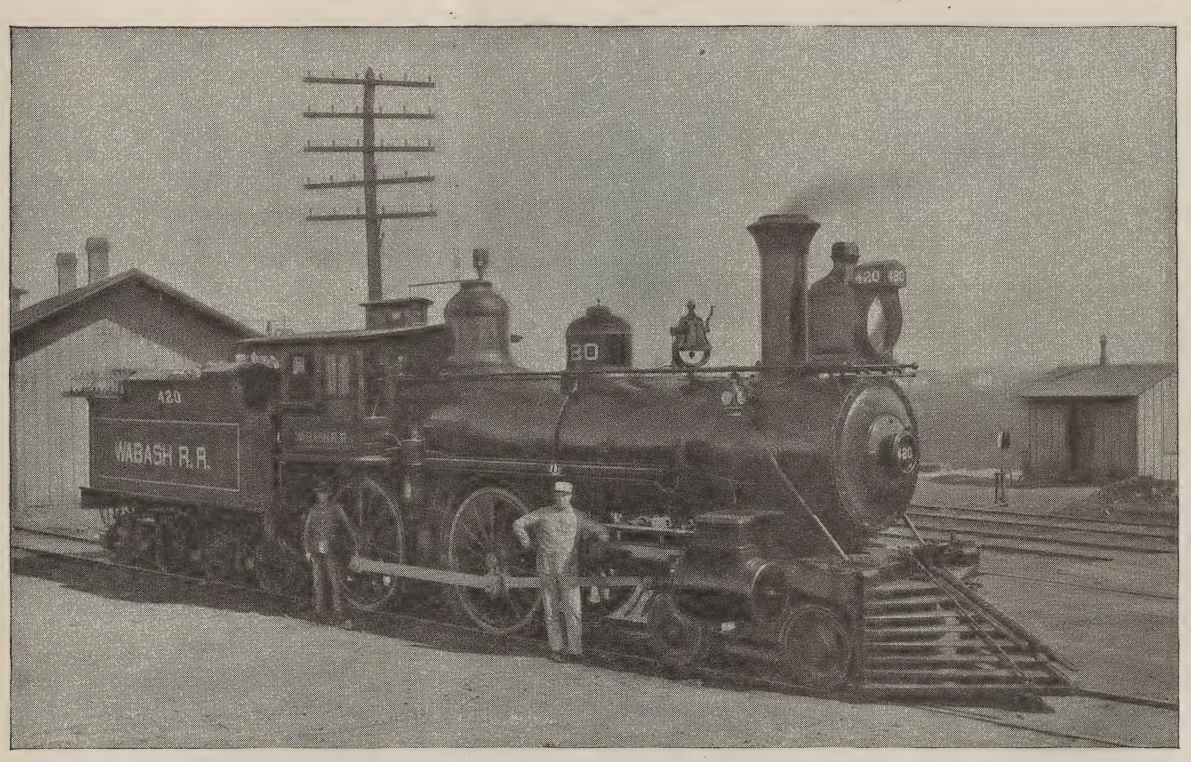
Although much of the old rolling stock is still in service on this division, it must not be surmised that anything on wheels here is obsolete. On the contrary, there is no stretch of road that we are familiar with that has more up-to-date motive power and shop appliances for facilitating the work of repair. No road keeps abreast of the times better than the Wabash, and, indeed, there are few whose rolling equipment equals that on this road. The passenger cars are models of the car builders' art, and the free reclining chair cars on this road are not surpassed on any Western road, and not equaled on any Eastern road, in the elegant appointments for the comfort and convenience of travelers. On these it is not enough that luxurious and ample reclining chairs are provided, with a porter in attendanee and downy pillows for weary heads, but in each car there are as large and as well appointed toilet rooms, smoking room and lavatory arrangements as are in a Wagner car.



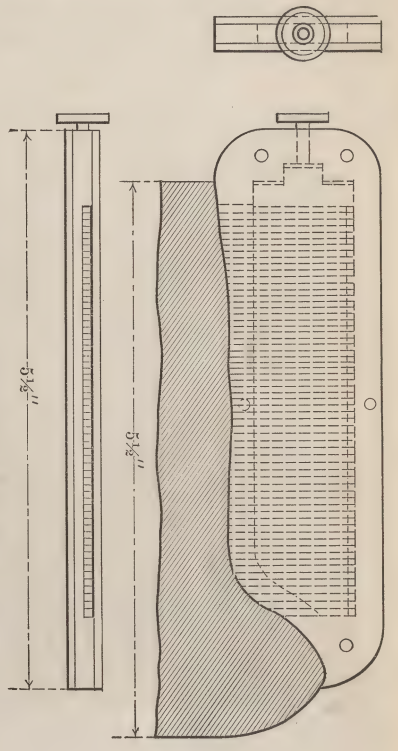
A Convenient Axle Truck.

the same on paper as a matter of record, and also for ascertaining the wear of the different tires on the same engine, as it is found at times that considerable variation exists in the wear. This gage is made of two pieces of sheet brass, filled between on the back like that of a clasp knife. Also one-half of the bottom is thus filled, allowing the small square pieces to drop by the filling and top side to shoulder against the rib. These small square pieces are made from soft iron wire. By planing a $\frac{1}{16}$-inch square groove in a piece of iron, the wire may be driven in this groove, giving it the proper shape. The square pieces in the gage may be filed to the proper shape. The screw in the end of the gage is for setting and holding these small pieces after trying the tire.

The axle truck was made for picking up and handling heavy bodies, such as driving axles, main and side rods, etc., around the shop. One man can pick up a load of 800 or 1,000 pounds with this truck and move it around the shops or yard very easily. The drawings will explain the remaining points in these handy tools.



Standard Wabash (Class F.) Passenger Locomotive.

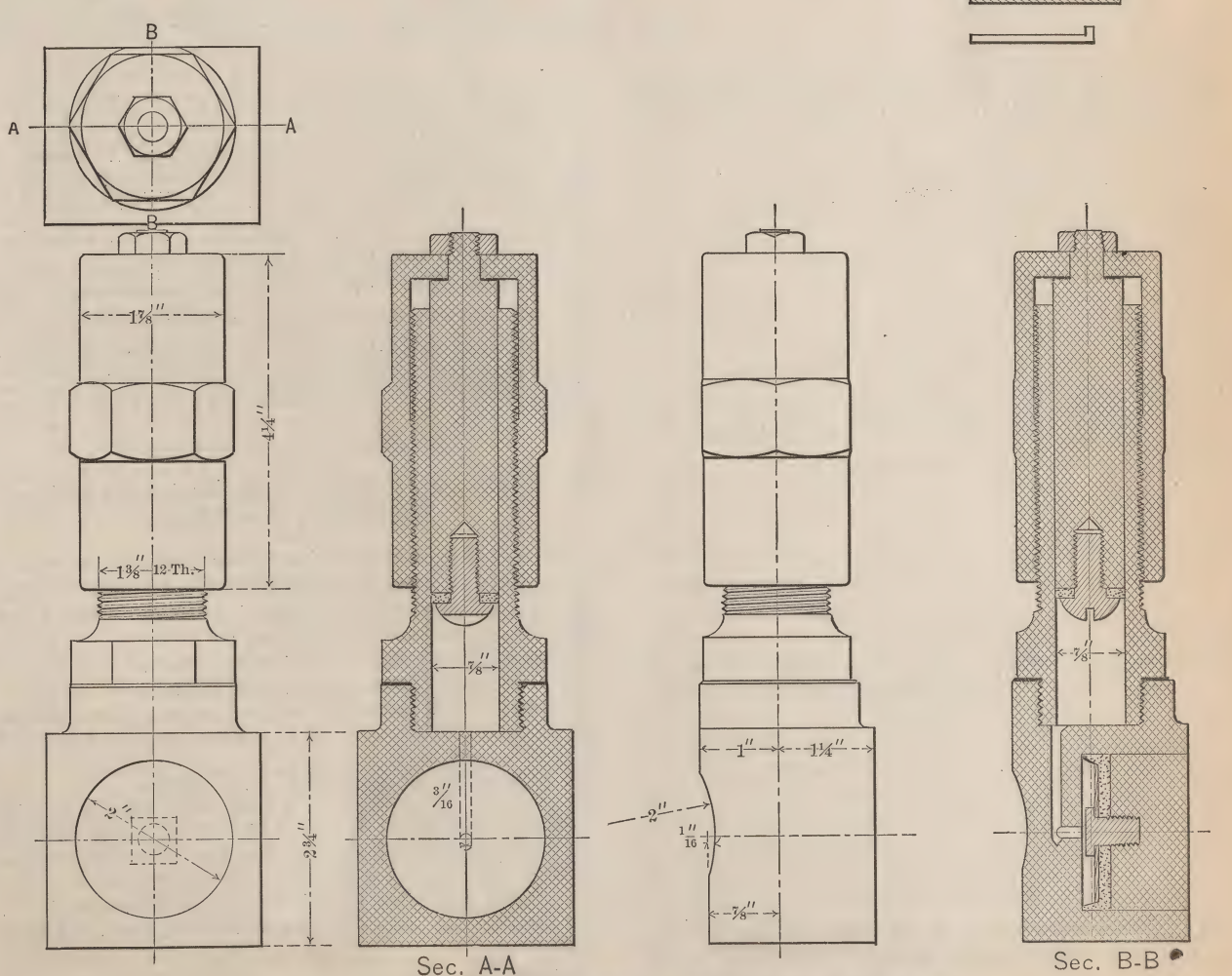


Adjustable Tire Gage.

The locomotives are modern in every particular, except those that are afflicted with the small boilers of previous years, and these are fast being replaced. In matters of detail, the refinements of locomotive building are more common on Wabash engines than on those of many other American railroads. We give an illustration herewith of one of the standard passenger engines; it weighs 99,000 pounds in working order, and has 18 inch by 24 inch cylinders, and carries 170 pounds of steam pressure. The driving wheels are 5 feet 2 inches in diameter. The boiler is 55 inches in diameter and contains 1,366 square feet of heating surface, and 16.5 square feet of grate surface. It is equipped with balanced valves, sight-feed lubricators, a close-notched quadrant, and a hopper tank and smoke-preventing appliance. It burns bituminous coal. Aluminum leaf is used for letters and numbers on Wabash engines, and presents a handsome contrast on a black surface.

In the Moberly shops the General Foreman's office is a room ample in size and neat in appointment, and situated at the center of one side of the shop, commanding a full view of every part of the same. Pneumatic appliances for facilitating the work are plentiful throughout the shop, which accommodates seven engines, there being in addition two finishing tracks. We reproduce herewith drawings showing several handy tools in use at these shops, and designed by Mr. Vliet. The first is a hydraulic jack for forcing pistons from crossheads. The construction is shown very plainly in the drawing. It is made of mild steel on account of the severe strain in pushing pistons from crosshead, as they stick at times. The rams are packed with leather, and should be pressed or crimped in proper shape before placing in jack. In regard to it Mr. Vliet says: "We have never found a piston that we could not remove with this jack, and it is far ahead of anything I know of for this purpose."

The tire gage was designed for the purpose of getting the exact section or wear of tires and transferring



Hydraulic Jack for Forcing Piston Rods from Crossheads.

Passenger Locomotive for the Concord & Montreal Railroad.

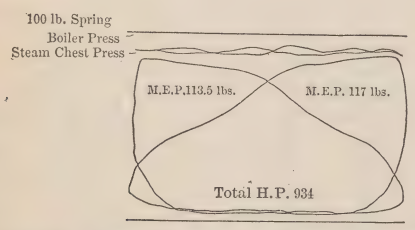
The accompanying engravings of photographs of the side elevation and rear view, illustrate a heavy passenger locomotive recently designed and constructed by the Schenectady Locomotive Works for the Concord & Montreal Railroad. We are indebted to the courtesy of the builders for the photographs and the following descriptive matter.

In designing the locomotive the builders were restricted to a weight on driving-wheels not exceeding 76,000 pounds. In order to reduce to a minimum the evil effect of reciprocating parts on the track through the counterbalance of driving-wheels, the pistons, crossheads, connecting rods, crank-pins and wheel centers were reduced to the minimum weight, so that the effect on the rail at a speed of 60 miles per hour is only equivalent to the ordinary construction of American type of engine with cast-iron driving centers, weighing 9,000 pounds less on drivers. The driving-wheel centers are of cast steel and of very light weight, and the crank pins are hollow, while the connecting rods, crossheads and pistons are greatly reduced in section from ordinary practice.

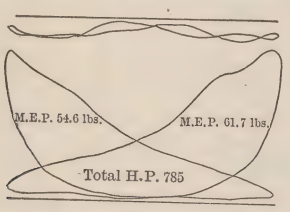
Particular attention was paid to making the locomotive convenient for the engineer and fireman; the arrangement of the reverse lever, throttle lever and all operating valves in the cab is such that they are as conveniently located as in the ordinary American type of locomotive having the deep firebox boiler.

As will be seen by the photograph and the following specifications, the boiler is of the extended wagon-top radial stay type with a wide firebox, extending out over the frames and over the back driving axle, and sloping down toward the front end, giving a depth of 25 inches below the shell of the boiler, thereby allowing ample space for the fire between the grates and brickarch.

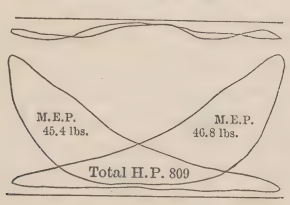
Previous to the delivery of this locomotive it was run a few trips on the New York Central Railroad on heavy fast passenger trains, and the accompanying indicator cards were obtained.



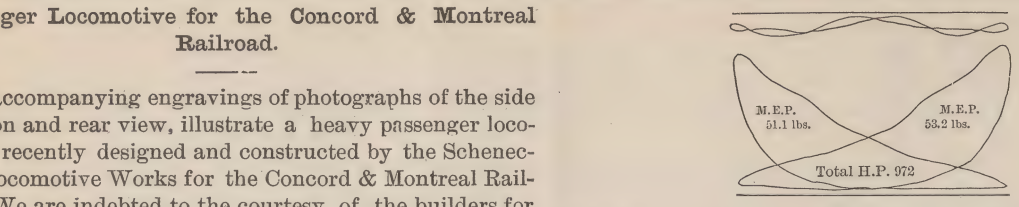
120 revolutions per minute; 25 miles per hour; 195-lbs. gage pressure; throttle wide open; cut-off, 12 inches; vacuum, 4 inches; working on 90 foot grade out of Albany.



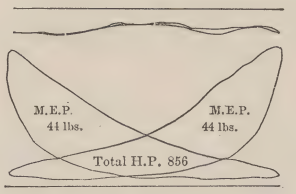
200 revolutions per minute; 41½ miles per hour; 190-lbs. gage pressure; throttle wide open; cut-off, $6\frac{7}{16}$ inches; vacuum, 3¾ inches.



260 revolutions per minute; 54 miles per hour; 182-lbs. gage pressure; throttle wide open; cut-off, $6\frac{7}{16}$ inches; vacuum, 4¾ inches



276 revolutions per minute; 57 miles per hour; 186-lbs. gage pressure; throttle wide open; cut-off, $6\frac{7}{16}$ inches; vacuum 4 inches.



288 revolutions per minute; 60 miles per hour; 185-lbs. gage pressure; throttle half open; cut-off, $6\frac{7}{16}$ inches.

The general design of the engine is similar to the sixteen engines recently built by the Schenectady Locomotive Works for the Boston & Albany Railroad.

The following are the principal dimensions and weight of the engine :

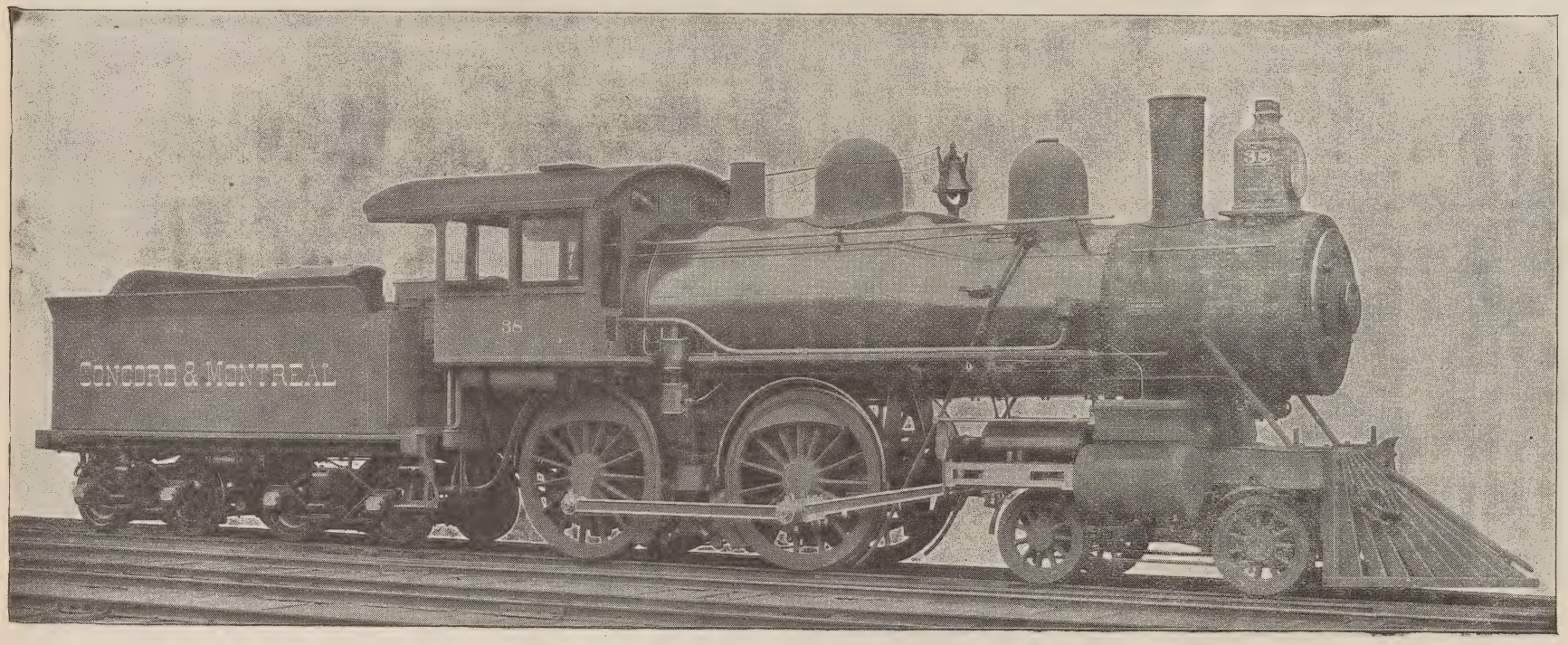
Cylinder diameter	19 in.
Piston stroke	24 "
Driving wheels, diameter outside of tire	70 "
Driving wheels, diamter of centers	63 "
Driving wheel centers of cast steel, tires held by retaining rings	
Boiler, extended wagon-top radial-stayed	
Working pressure	190 lbs.
Boiler diameter at front end	60 in.
Boiler diameter at back end (back head a true circle)	70 "
Firebox (inside length)	90 "
Width inside	40½ in.
Firebox, depth at back end	61¾ "
Firebox, depth at front end	73¾ "
Tubes, number of	299
Tubes, diameter	2 in.
Tubes, length	11 ft. 6 in.
Tubes, space between	¾ in.
Weight of engine in working order	116,400 lbs.
Weight on drivers	75,000 "
Total wheel base of engine	23 ft. 9 in.
Driving wheel base of engine	8 ft. 6 "
Driving axle journals	8 by 11
Engine truck journals	6 by 10
Tender truck journals	4½ by 8
Diameter of engine truck wheels	33 in.
Diameter of tender truck wheels	36 "
Tank capacity	4,000 gals.

Tender frame is made of 6½ by 4 by ¾ angle iron.

The tender trucks are the Schenectady Locomotive Works standard iron truck with channel iron floating bolsters and inside brakes.

Engine and tender truck wheels are the Snow boltless steel-tired wheel

The locomotive is fitted with the Westinghouse air brake on driving wheels, tender and train; Westinghouse air signal, Richardson balance values, Leach sand feeding device, Nathan & Co. sight feed cylinder oiler, Hancock inspirators and Smith triple expansion exhaust nozzles.



CONCORD & MONTREAL 8-WHEEL PASSENGER LOCOMOTIVE.

Subjects and Committees for the Master Car Builders' Convention, June, 1896.

The following named subjects and committees have been announced, showing the work undertaken for the coming year by the Master Car Builders' Association, and to be reported on at the next convention :

1. *Metal for Brake Shoes, Laboratory Tests.*

S. P. BUSH, D. L. BARNES, JNO. W. CLOUD.

In making final report this committee to confer with the Executive Committee of the Committee on Road Tests of Brake Shoes of 1895.

R. H. SOULE, A. E. MITCHELL, W. S. MORRIS.

2. *Automatic Couplers.*—To advise what changes may be desirable in the standard size of M. C. B. automatic coupler shanks, and to recommend a standard yoke or pocket strap for rear end attachment to cars.

J. M. WALLIS, R. D. WADE, T. G. DUNCAN, A. E. MITCHELL, WM. GARSTANG, THOS. KEARSLEY, J. T. CHAMBERLAIN.

3. *Mounting Wheels.*—To review the subject of mounting wheels and the standard check gage, together with the standard distance between wheels.

J. N. BARR, A. M. WAITT, J. H. MCCONNELL, R. E. MARSHALL, J. C. BARBER, THOS. SUTHERLAND, PULASKI LEEDS.

4. *Passenger Car Ends and Platforms.*—To consider what improvements may be made in the construction of passenger car ends and platforms for increased strength in ordinary service and in emergencies.

E. W. GRIEVES, F. D. ADAMS, J. J. HENNESSEY, C. A. SCHROYER, M. M. MARTIN, SAMUEL PORCHER, T. A. BISSELL.

5. *Axle, Journal Box, Bearing and Wedge for Cars of 80,000-pounds Capacity.*—To propose standards with detailed drawings of same.

E. D. NELSON, WM. FORSYTH, J. E. SIMONS, J. H. RANKIN, JOHN HODGE, F. W. CHAFFEE, GEO. GIBBS.

6. *Metal Underframing for Freight Cars.*—To discuss the extent to which metal may be used with economy and advantage ; also the best forms.

R. P. C. SANDERSON, D. L. BARNES, ROBT. MCKENNA, J. D. MCILWAIN, CLEM. HACKNEY, JOHN PLAYER, J. R. SKINNER.

7. *Location of Air-brake Cylinders on Freight Cars.*—Having in view easy access for cleaning and repairing.

JAMES MACBETH, B. HASKELL, A. C. ROBSON, ROBERT GUNN, F. B. GRIFFITH, JOEL WEST, H. C. MCCARTHY.

8. *Freight Car Doors and Attachments.*—To inform the Association as to the latest improvements and the best practice.

F. H. SOULE, B. E. THOMSON, CHAS. WAUGHOP, J. J. CASEY, THOS. FILDES, A. J. CROMWELL, W. J. ROBERTSON.

9. *Handholds and Height of Drawbars.*—Te review the recommended practice in regard to handholds, and to advise whether greater uniformity can be secured in their location on cars of different types or classes, and to advise what will best conform to the requirements of the law. Also to advise what shop or repair practice will be most desirable in order to have the height of drawbars at all times in conformity with requirements of law.

H. S. HAYWARD, TRACY LYON, L. B. PAXON, S. A. CHARPIOT, J. W. MARDEN, S. HIGGINS, S. A. CRONE, W. A. NETTLETON, C. A. SCHROYER, J. MACKENZIE, A. E. MITCHELL.

10. *Uncoupling Arrangements for M. C. B. Automatic Couplers.*—To consider whether a standard uncoupling device is practicable and the details thereof.

G. L. POTTER, SAMUEL IRVIN, G. W. WEST, C. E. TURNER. R. M. GALBRAITH, G. B. SOLLERS, R. C. BLACKALL.

A Compound Test.

Referring to Mr. P. H. Peck, Master Mechanic of the Belt Railway of Chicago, a writer in the *Railway Age*, says :

"Our friend Peck of the Chicago & Western Indiana and Belt has recently given an exhibition of his usual astuteness. He has always taken considerable interest in the Richmond compounds at the various times when one of them has been on exhibition near Chicago. He has enjoyed several rides on them, dangling his feet over the pilot or sitting on the coal pile. He has expressed himself as much pleased with the engine's performance. So the other day when it was required to transfer the engine from the tracks of the Rock Island to those of the Northwestern, Mr. Peck was pleased to tender the courtesies of his road. Incidentally he would like to see how she worked on his line. Therefore, he had a nice little train of fifty loads of sand which was to go in that direction. and did Mr. Symington think the engine would haul it? Symington is never diffident where the Richmond compound is concerned and he joyfully coupled on. Peck soon had his fifty loads of sand where he wanted them and was loud in his praises of the engine. It was a pretty good test, but it seems to me Peck had the best of it."

Pullman's Palace Car Company has advanced the wages of its 4,000 employés 10 per cent. It is said that the advance is due to the bright business outlook.

Electric Locomotives for the Baltimore Tunnel.

One of the heavy electric locomotives for service in the tunnel under the city of Baltimore, by which the trains of the Baltimore & Ohio Railroad enter and leave to and from the north, is at last completed and at work. We present herewith a photo-engraving showing a side view of one of these mammoth machines, which are the largest and most powerful of their kind in the world. They weigh 96 tons and are capable of hauling passenger trains weighing 500 tons 35 miles an hour, and freight trains weighing 1,200 tons, 15 miles a hour, on an 8 per cent. grade. They were built by the General Electric Company and seem well adapted to the work for which they were built. The following are the general dimensions of these locomotives:

Number of trucks	2
Number of motors	4—2 to each truck.
Weight on driving wheels	192,000 pounds (96 tons).
Number of driving wheels	8
Drawbar pull	42,000 pounds.
Starting drawbar pull	60,000 pounds.
Gage	4 feet 8½ inches.
Diameter of drivers	62 inches outside of tires.
Length over all	35 feet.
Height to top of cab	14 feet 3 inches.
Wheel base of each truck	6 feet 10 inches.
Extreme width	9 feet 6¼ inches.
Diameter of sleeve bearings	13 inches

The driving gear consists of a cast steel spider shrunk on and keyed to a cast steel driving sleeve, having a tensile strength of 80,000 pounds. Each arm of the spider is provided with a double rubber cushion, with a chilled cast iron wearing cap, the cushion being forced into the arms of the spider and the cap. The eight driving wheels are of cast steel pressed and keyed to the axles, and have tires 3 inches thick shrunk on. The driving axles are of open hearth steel. The journal bearings are outside the driving wheels and allow of easy access to all parts of the truck frame and driving boxes. These are of cast iron with phosphor bronze bearings fitted in a similar manner to that of a steam locomotive driving box. It slides in jaws protected by shoes in the same way. The box is closed at the bottom and has a well for oil and waste, as well as a dust guard lid, etc., similar to a passenger car journal box. Large grease cups are cast in the journal caps, giving a satisfactory lubrication to the motor bearings.

The opposite side frames of each truck rest upon four wheels, each consisting of one piece of hammered wrought iron 3½ inches thick, to which the frame jaws are welded, and are connected together at the ends by heavy forged iron plates, with oak bumper beams between them.

The drawheads are of the Janney type, similar to those used on tenders, and are made of cast steel with wrought iron knuckles. The front and back of the locomotive is provided with safety chains, and, in addition to the regular couplings between the trucks, safety links are used. The buffers between the motors act as spacers for and fit between plane surfaces in the field magnets. These spacers have a complete freedom of movement, which allows the field magnets to rotate when the motor is in action. These buffers and spacers are so placed as to permit the interchange and reversal of the positions of the field magnet, without requiring change in the position of the spacers. The motors are supported on carriers bolted to the field magnets, and rest in adjustable hangers carried on half elliptical springs placed on top of the frame and bumpers. The frames thus carry the motors by carriers and springs, and this load is carried in turn by rubber blocks in cast iron casings.

The cab is of sheet steel. Two drop windows are provided at each end and four at each side, so that an unobstructed view may be had in all directions. The doors slide laterally on large rollers, and are placed one on each side of the cab. The cab is supported on the frame by four half elliptical springs. The cab steps are attached to the cab only, and hand-rails are placed at each door. The shields are also of sheet steel supported on coil springs directly on the bumpers, and are adapted to receive the air tanks at the ends, and bell, whistle and headlights on the top. The arrangement is such that all the commutators are visible to the motormen.

The locomotive is fitted with sand boxes, and Westinghouse automatic driver and train brakes are provided for all wheels, bearing upon the flanges and treads. A brass signal gong 8 inches in diameter is placed in the cab to be rung from either end of the locomotive. The headlights, of which there are two, are placed on the top of the shields at each end. A whistle and bell are provided, and are operated by compressed air, the bell automatically.

The gearless motors are four in number, two to each truck, flexibly supported and transmitting their power to the wheels through the flexible connections described above. They are of pyramidal shape, are the largest railway motors in the world and, while ponderous in appearance, are by no means so bulky as might be expected from the heavy work they have to perform.

Each motor is rated at 360 H. P. and takes a normal current of 900 amperes. The controlling devices, etc., occupy the interior of the cab. The controller is erected in one half of the cab, and is of the series parallel type. The reversing lever projects through the upper plate of the controlling cover. The resistances are placed around the frame beneath the floor of the cab.

The locomotive is equipped with a 1,200 to 3,500 automatic circuit breaker and one 2,000 ampere magnetic cut-out, a 5,000 ampere illuminated dial Weston ammeter and one illuminated dial Weston voltmeter. The compressed air for the whistles and brakes is supplied by an oscillating cylinder electric air pump, the air tanks being placed at each end of the complete locomotive. The interior of the cab is illuminated by clusters of incandescent lights.

Contact with the overhead conductor is effected by means of a sliding shuttle-like shoe of brass, which is fixed to a flexible support fastened to the top of the cab. This "trolley" support is diamond shaped and compressible, contracting and expanding as the height demands, and is arranged to lean on one side or the other as the locomotive runs on one side or the other of the overhead conductor. It is, however, rigid in so far as movement forward or backward over the locomotive is concerned. The current is brought to the locomotive by means of cables connected to the shoe and fastened to the "trolley" support.

The distance over which the electrical locomotives will operate is about 15,000 feet, passing through two tunnels, 7,339 feet and 265 feet long, respectively, and over 7,396 feet of track in the open from Hamburg street to Huntington avenue. Three tracks are laid into the southern portal, two tracks passing through the tunnel, four tracks from the northern portal, through the Mt. Royal Avenue arch, and two tracks as far as Huntington avenue, where a siding is provided for the electric locomotives. There is a steady grade of 0.8 per cent. from the Southern through to the Northern portal, and the lines in the open have two curves of 10 degrees with a steady gradient of 1½ per cent. At the power house end of the line the locomotives run on a siding at the beginning of the long open cut running down to the southern portal.

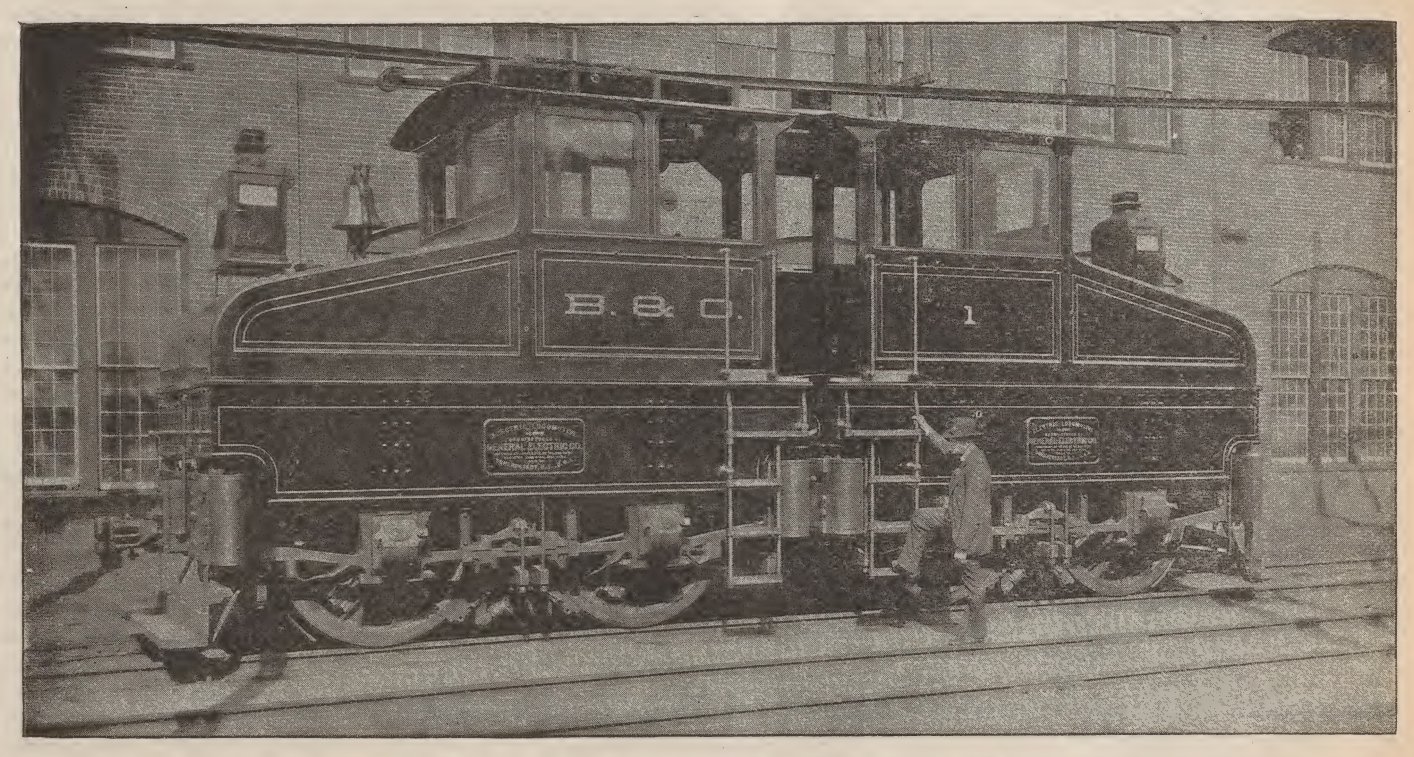
The operation of the freight trains will begin at the main tracks south of the Camden station, where they will be switched into the cut. The electric locomotive will then couple on behind, without stopping the train, and push it through as far as the Mt. Royal Avenue portal, a distance of 8,146 feet, the steam locomotive doing no work. After passing out of the tunnel, both steam and electric locomotives pull and push together up the heavier grade as far as Huntington avenue, the average speed over the entire distance being about fifteen miles an hour. At Huntington avenue the electric locomotive will uncouple and run into its siding.

The plan of pushing the passenger trains through the tunnels has been abandoned, in view of the possible results if one of the cars or the steam locomotive should leave the track in front of the heavy electric locomotive traveling at thirty miles an hour. The passenger trains will, therefore, be pulled through from the Lombard Street station near the south end of the tunnel to the Bolton Street station at the north end.

The power house is a one-story brick building 30 feet high and has a slate roof. It is practically fireproof. It is divided into two parts, the engine room occupying the north portion, being separated from the boiler room by a brick wall. The entire length of the building is 322 feet 1 inch; the dimensions of the engine room, 223 feet 10 inches in length by 57 feet 9 inches wide, and of the boiler house 98 feet 3 inches by 69 feet wide.

The boiler house is a spacious and lofty room, having 12 boilers (250 horse power) arranged in six batteries, three of which are placed on each side of the center passage. It is lighted from the roof, The boilers are of the Root water tube type. Each boiler is 12 tubes wide and 11 tubes high, with six 14.5 inch-drums and a 30 inch-steam drum. Space is left for an additional boiler on the west side of the room.

The tunnel, of which we give an interior view, was undertaken to give the Baltimore & Ohio Railroad a clear route through to the North. Previous to its completion all trains on this road running between Baltimore and the North were compelled to take a devious course and were transferred to a ferry running between Locust Point and Canton. The delay which this water transfer entailed acted for many years to the great disadvantage of the company, as other lines had a clear all rail route through the city. To do away with this delay legislative permission was obtained to construct a tunnel under the city, and in September, 1890, work was begun upon the tunnel and line, which now runs from Camden Station, in the heart of the city, north, and then east to Bay View Junction, a distance of 7.2 miles. The tunnel is one of the longest soft earth tunnels ever driven, and runs through the center of the city, immediately under Howard street, one of Baltimore's principal thoroughfares. It was built with almost no interruption to the incessant car and wagon traffic upon the surface of the street, and to secure this result several shafts to the tunnel below were sunk through the cellars of houses. The length of the tunnel is 7,339 feet, and the maximum dimensions, after lining, are 27 feet wide by 22 feet high. Its cost, ready for the track, is set down at $225 a lineal foot.



Side View of Electric Locomotive for the Baltimore Tunnel.

When it was decided to construct the tunnel the question of its ventilation became urgent. The disadvantages of its operation by steam locomotives were patent, and it became necessary to find a means of doing away with the smoke and gases either by a scheme of ventilation or the abandonment of steam locomotion in the tunnel. Cable traction was suggested, and other schemes, but all in turn were rejected as inadequate or unsatisfactory. It was then decided to undertake the construction of electric locomotives of capacity sufficient to haul the heaviest trains, and equip the entire system with electric power, thus solving the ventilation problem. The contract for the work was awarded to the General Electric Company. The plan as outlined has been carried out with such modifications as have been found necessary as the work progressed. Preparations were made to commence the work of construction on the locomotives, so that they should be ready at the time the tunnel was opened, which event was set for March, 1893. The tunnel was, however, not finished until early this year, and the electric installation was not begun until January, 1895.

The net earnings of the Union Pacific for May show an increase of $287,123 over May, 1894.

The Chamber of Commerce of Macon, Ga., recently addressed a note to President Samuel Spencer, of the Southern Railway Company expressing some apprehension as regards the policy of that company toward the commercial interests of Macon, and seeking an expression from him as to the policy that the Southern Railway would follow. Replying, Mr. Spencer declared that those interested in the railway recognize the fact that in building up Macon's interest they will be forwarding those of the company, that anything done to injure the one will injure the other. He called attention to the fact that the policy of the company had not resulted in the increase in rates at any point, but had resulted in better roadbed and equipment, improved service and greater safety to the public.

NATIONAL CAR AND LOCOMOTIVE BUILDER

ESTABLISHED IN 1870.
PUBLISHED MONTHLY
BY
R. M. VAN ARSDALE,
MORSE BUILDING.....NEW YORK.

GEORGE H. BAKER, Editor.

HERBERT W. POOL, Business Manager.

AUGUST, 1895.

Subscription.—*$2.00 a year for the United States and Canada; $2.50 a year to Foreign Countries embraced in the Universal Postal Union.*

EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING PAGES. *The reading pages will contain only such matter as we consider of interest to our readers.*

Special Notice.—*As the* NATIONAL CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, correspondence, advertisements, etc., intended for insertion must be received not later than the 25th day of each month.*

Contributions.—*Articles relating to railway rolling stock construction and management and kindred topics, by those who are practically acquainted with these subjects, are specially desired. Also early notices of official changes, and additions of new equipment for the road or the shop, by purchase or construction.*

To Subscribers.—*The* NATIONAL CAR AND LOCOMOTIVE BUILDER *is mailed regularly to every subscriber each month. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery, and in case the paper is not then obtained this office should be notified, so that the missing paper may be supplied.* **When a subscriber changes his address** *he ought to notify this office at once, so that the paper may be sent to the proper destination.*

ELECTRIC MOTIVE POWER.

In our last issue we illustrated and briefly described the new electric cars built for the Nantasket branch of the New York, New Haven & Hartford Railroad, and in this issue we publish a further description of these cars. We also publish in this issue an illustration and description of the new electric locomotive put in service in the Baltimore & Ohio tunnel, also a description and illustrations of the new electric cars built for the Mount Holly branch of the Pennsylvania Railroad. The locomotive and cars mentioned were built to supplant steam motive power in the service in which they are engaged. As regards the time of beginning service these three cases come pretty close together, and they have impressed many people with the belief that electricity is about to supplant steam motive power on our railroads. It should be remembered, however, that except in the case of the Baltimore & Ohio tunnel these trials are mere experiments; and as regards the tunnel, the character of the service there demanded motive power that would not emit smoke and gases in the tunnel.

We have no doubt that these experiments will prove satisfactory so far as the actual performance of the work desired is concerned. Comparative economy between steam and electric locomotives cuts no figure in the case of tunnel service, but it does in regard to the operation of branch lines of large roads, and unless the experiments being made on the two branches mentioned prove economical they are not likely to be repeated on many other branches of the same roads; although other roads may take similar steps simply to appear progressive and for the sake of advertising. Indeed, it is likely that even the experiments mentioned have been undertaken more with this aim in view than anything else. It is a kind of advertising that will cease to be valuable as soon as it becomes common.

THE BUSINESS SITUATION.

The general improvement in business is most gratifying, and the prospect for further steady if not rapid improvement is most excellent. Those who have read the daily accounts of the increase of wages in all parts of the country and in many different industries must have been impressed with the fact that not in many years, if ever, has there been such a rapid and widespread increase in the wages of workingmen in this country. Careful estimates published declare that over 1,000,000 employees in many industries have had their pay increased 10 per cent. This is in itself not only a declaration of present improvement in business, but an assurance of further and still more widely diversified improvement. The wages of these employees will find their way into every conceivable channel of trade. In addition, and coming as the final assurance, is the splendid and in some sections unparalleled abundant condition of the grain crops. This assures heavy traffic for the railroads in handling the grain and the inevitable return shipments of merchandise, and this assures the reemployment of many thousands of men in railroad service, and many thousands in allied industries at good wages.

The railroads have been adding largely to their rolling stock in order to handle the increased traffic offered, and the net earnings of roads in all sections of the country show increases—many showing now an increase over earnings in 1894 for the first time this year. The increase in car and locomotive building in the first six months of this year compared with the same period of last year is very great. In the period for 1894 there were 68 locomotives and 7,997 cars ordered, according to our published records. According to the same records the number of locomotives ordered in the period for this year is 312, an increase of 244, and the number of cars 24,766, an increase of nearly 17,000. The value of the locomotives ordered in the first half of this year approximates $2,500,000, and that of the cars $12,500,000. These engines and cars are not all built yet, and judging by the numerous orders published in this issue, and not included in the above estimate, the car and locomotive building industries have good prospects of plenty of work for the balance of this year. Indeed it is probable that there will be an harassing car famine this fall and shortage of locomotives.

BOILER TUBES.

The Master Mechanics' Association Committe on the "Best Material and Specifications for Locomotive Boiler Tubes" rendered one of the most valuable reports presented to the last convention. There has been great diversity in the practice of master mechanics relative to the use of tube material, and heretofore the Association has been practically silent about the matter. Tubes constitute a very important part of locomotive boilers, and economy of operation and even the ability of the engines to do their required work depend on good tight flues. Leaking flues are fatal to both efficiency and economy.

The report points out that to obtain lasting results it is necessary to use tubes and safe ends of the same material, and that this should be the best that can be had. Imperfect welds can only result when steel tubes are welded to iron ends or *vice versa*, because the melting point of steel is so much lower than that of iron (about 500 degrees) that, as the report says: "When iron is brought to the welding heat steel is burned. Steel safe ends may be perfectly welded to steel tubes, and iron ends to iron tubes; but when tubes and ends of different materials are joined, imperfect welds will result."

Steel tubes are said to "pit" and become eaten out sooner than iron tubes, and to be harder to keep tight than iron tubes in localities where the feed water is bad. The committee recommends "knobbled hammered charcoal iron" as the best material for tubes, and names some simple physical tests to ascertain if the material is up to the requirements, the principal among these being to cut strips lengthwise from tubes and turn the ends over in opposite directions in order to test the interior and exterior layers of iron. The recommendations of the committee were adopted as standard practice, and will doubtless serve as a useful guide in securing good tubes.

CAR WINDOWS AND BLINDS.

Car windows that stick fast are a discredit to the builder and an aggrevation to the traveler. The instances are rare where the design of cars contemplates that the windows shall remain closed. Generally they are put in with the evident intention that they shall be under the control of passengers. In warm weather it is customary for passengers to desire and have the windows open in order to get the benefit of the refreshing inrush of air. The landscape is generally seen also to better advantage through an open window.

These conditions will probably not be changed materially for some years to come, and certainly not until means are employed to artificially cool cars for the summer as carefully as we now warm them in winter. When one enters a car in summer that is uncomfortably warm and is balked in his efforts to raise a window he at once feels that he has a grievance against the railroad. This does not help earnings along any, but tends to the contrary. All objectionable features that travelers meet with tend to reduce earnings on the lines tolerating them, either by diverting patronage to other lines or by making trips less frequent. For these reasons special attention should be given to the construction of car details to insure that they will remain in condition to properly meet their intended purpose. Windows when designed to be opened or closed at the will of those who sit by them should be made to do this easily, and there should be enough of clearance provided between the movable sash and the frame to prevent sticking in wet weather.

The old wooden blinds for car windows that raise and lower like the windows have many friends and are still in wide use on numerous roads. The roller shade is fast supplanting them, however, and properly so. In the long run shades of proper material and fixtures may cost more than blinds, but they have numerous advantages that are of money value to any railroad, the chief among these being the ease with which they may be raised or lowered to the desired position, and the improved appearance they give to both the interior and exterior of cars. Wooden blinds frequently stick fast, and are obstinate in their movements on nearly all occasions. They are trappy and inconvenient. Roads that are giving increased attention to the refinement of details that affect the comfort of their patrons are getting rid of them.

Another point in the construction of car windows is the height to which the sash should rise with reference to the vision of passengers seated by them. Frequently this receives no consideration, and the result is that the lower piece of the sash frame comes directly in line with the eyes of a seated passenger when the sash is up. To see out when seated beside such a window one needs the neck of a giraffe so that his head can be easily raised or lowered to see above or below the obtruding piece of wood. Windows that are amply large, that move easily, and that rise to a good liberal height and are spaced to conform with the spacing of the seats are the only kind that ought to be used.

BOILER FEEDING.

We have received numerous letters in reference to our comments on this subject in our last issue. They have come from superintendents of motive power, professors of engineering, division master mechanics, road foremen and others, and with two exceptions heartily endorse the statements we made. We would be pleased to publish these two letters but have not the permission of the writers to do so. As illustrative of the character of the other letters we publish several of them under the head of "Communications" on another page. We commend these to the careful perusal of those of our readers who still have doubts about the propriety of working injectors when locomotives are idle or running shut off. The letter from F. C. C. is particularly interesting as describing in the most lucid possible way the best method of feeding locomotive boilers with injectors. The writer of the letter is an exceedingly able and well-known master mechanic. He instructs his engineers to always shut the injector off when starting trains, and leave it off until the engine is working easier (at short cut off) and the fire has got to burning well. Even then the injection is adjusted so that the supply of water is a little less than an equivalent to the consumption of steam, in other words, such that the boiler looses a little in its supply of water until steam is shut off again, when by continuing the injection the normal supply is quickly and cheaply restored. It is, in fact, restored by the utilization of surplus heat that would otherwise be wasted in steam blowing through the pop. The advantage of this plan results from storing up this surplus heat while running shut off, and perhaps standing at stations, and utilizing it to decrease the necessary rate of combustion while running to the next station. This, in locomotive service, is largely economical of fuel. No injurious results to boilers follow this practice, unless it be carried to the excess of reducing the steam pressure and consequent temperature of the boiler. Evidently this is not done on our correspondent's road. It is practiced there within reasonable limits.

Since the above was put in print the very sensible article headed "Boiler Feeding from an Engineer's Standpoint" and appearing on another page, was received. It is from an experienced engineer and road foreman of engines, Mr. C. B. Conger, who is President of the Traveling Engineers' Association. His remarks agree practically with those referred to above and describe three different ways of operating the injector, only one of which, as he shows, is proper and economical.

Whether the water-level should be kept up after the injector is started while running, as Mr. Conger intimates, or still further lowered by a little less than an equivalent supply, as advocated by C. F. C., depends on circumstances and the available water-space in the boiler. If the conditions are favorable, the *slightly* less than an equivalent supply while running is most economical, and therefore best. What Mr. Conger says about the fact that if this method "helps the poor steamer make steam it will help the good steaming engine save coal," is exceedingly pertinent and wise. Too many engineers, and mechanical officers also, seem to consider that painstaking boiler feeding is only required with poor steaming engines, when, in fact, the practice that is followed to get sufficient steam with poor steaming engines should be followed just as assiduously with good steaming engines to save coal.

There is one point in our correspondent C. F. C.'s letter, that deserves special attention; it is in regard to keeping engines standing for hours fired up waiting for trains for which they are ordered. The writer says:

"The principal difficulty I have is from water getting cold at the bottom, while waiting to go out on the run. Frequently, when trains are late, engines will stand from one to two hours, and the fireman who has not been carefully guarding against it will find, when the engine pulls out with the train, that it looses steam very rapidly in spite of all the efforts to keep it up; thus showing that the water had cooled at the bottom while the engine was standing still with only a moderate fire."

We have abundant evidence that there can be a considerable variation of temperature of water in a boiler even under steam pressure and with a fire on the grates. The loss of pressure in starting trains noticed probably results from the large use of steam, in addition to considerable condensation caused by the comparatively cold steamways, steam chests, valves and seats, cylinders and heads and

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pistons; also from the low heat of the fire before it has got to burning well. No doubt the condition of the fire while an engine is waiting hours for a train may be such as to allow an actual cooling of the water in the boiler, which as cooled would naturally sink to the bottom. With a low fire on the grates and the door ajar it is probable that the temperature of the gases from the fire (diluted with the cold air drawn by natural draught through the doorway) passing through the flues, will be less than the temperature of the water in the boiler, about 350° or 360°. Of course the water would then be cooled. This shows an additional reason than has heretofore, to our knowledge, been mentioned why engines should not be ordered fired up and kept standing idle hours before they are needed to go out on their runs. For economy of fuel and for economy in boiler repairs, carelessness in this respect should be avoided.

We publish in this issue the list of subjects to be investigated during the coming year by committees of the Master Car Builders' Association, and doubtless the subjects and committees of the Master Mechanics' Association will soon be announced and the committees will get started on their respective investigations. An early start in this work will lighten the labor of investigation and certainly result in increased excellence of reports. Some of the committees will have an unusually large number of members, but this should not act to lighten the feeling of individual responsibility. Each member of a committee should feel that the excellence of its work devolves largely on him, and chairmen should encourage this sentiment.

Literature.

Cassier's Magazine for July is a specially handsome edition, devoted principally to articles descriptive of the electric power plant at Niagara Falls. It contains 10 such articles, contributed by writers identified with the plant. These are profusely illustrated, and give the most complete information respecting the history and construction of this greatest water power plant ever published. The illustrations are mostly from photographs, and are well executed. There are nearly 200 of these, including portraits of the officers and directors of the Cataract Construction Company, the members of the International Niagara Falls Commission and the engineers under whose supervision the work of construction was carried out.

A Remarkable Wreck.

A cablegram from Kobe, Japan, dated July 28, reports a most unusual railroad disaster by which 140 Japanese soldiers lost their lives. A train of 23 cars was conveying 400 Japanese soldiers, who were returning from China, where they had taken part in the military operations. A heavy storm was raging and as the train was running along the seawall on which the tracks approaching the city named are laid, an immense wave leaped over the wall, separating the train and derailing the engine and 11 cars, which plunged off the wall into the bay. Most of the men in the cars were drowned. The accident occurred at about 1 o'clock A. M., and the night was pitch dark. The sea was running so high that it was impossible to render any assistance to the men in the cars that had gone overboard, even had means been at hand to do so. Some of the men who managed to get out of the cars while they were in the water, were dashed to death against the wall.

More Time Granted to Comply With the Safety Appliance Law.

A number of railroads applied to the Interstate Commerce Commission for an extension of time in which to comply with the law requiring grab-irons. It is said that the C., B. & Q. has 20,000 cars yet to be supplied with these, and other large roads are in about comparatively the same fix. A hearing was granted on July 12, at which Mr. John W. Cloud presented 55 letters authorizing him to represent as many roads in asking this extension, besides which petitions were presented by the individual attorneys of the Seaboard Air Line System, the Lake Shore & Michigan Southern, the "Big Four," "Nickel Plate," Boston & Maine and Philadelphia & Reading roads.

On July 15 the Commission decided to grant the request to extend the time within which the law shall go into effect. The ruling of the Commission is that the time within which hand-holds shall be put upon cars shall be extended to Dec. 1, 1895, and the time within which all drawbars shall be changed to a uniform height shall be extended to Feb. 15, 1886.

The reasons for the extension of time, as stated officially by the Commission, are briefly as follows: That while some roads have exercised due diligence in making the required changes, others have not done so, and those who have done so are unable to fully comply with the law except by refusing to haul cars not so equipped or arranged through no fault of their own; that it appears that the failure of some roads to comply with the provisions has been due to the diminished earnings consequent upon the protracted depression of business; that the exercise of two great haste in compliance would result in insecurity of parts and consequent danger to trainmen, and a greater degree of uniformity will be secured by the allowance of a longer time, and that all interests concerned will be thus served.

Home Made Brass Castings.

At the May meeting of the North West Railway Club the subject "Is it advisable for railway companies to manage their own brass foundries in preference to buying their brass castings," was discussed. Mr. Dickson, of the Great Northern Railway, said:

After some years of experience under both plans, I am firmly of the opinion that it does pay and pay well. Our road prior to 1892 contracted for all its brass castings from outside firms, they it turn purchasing our scrap. The casting was of fair quality and was delivered in reasonable time. In the latter part of 1892 our company built its own brass foundry, a stone structure 45 by 32 feet, and equipped it with the necessary tools, consisting of nine furnaces, one core oven, four moulders' troughs, one car brass borer, one emery wheel and brass saw, one magnetic separator, one small rattler, and other small tools such as flasks, tongs, crucibles, etc., at an estimated cost of about $4,500. The following is the product of each year, and the saving over the estimated cost:

First year's product 450,196 pounds, saving effected, $3,435.

Second year's product 258,484 pounds, saving effected, $1,633.

Third year's product 317,230 pounds, saving effected, $2,836.

You will notice that the above figures go to show that the savings have more than paid for the plant, and is just about the a mount realized per year by the proprietor from the railway company, on the supposition that he is honest in following his specifications.

Furthermore, I claim that there is a decided advantage to the railway company in the mixing of its own metals. It can with more certainty have a greater number of grades with better uniformity when the mixing is done by a good, reliable man under your own observation. You then know that each particular grade contains the proper proportions which so excellently fit it for its special service.

Then, there is the question of scrap—its selection and distribution—which is a matter of great importance both in the way of economy and good service. We grade our scrap into two classes, namely, No. 1 and No. 2. No. 1 scrap comes from old driving brasses, rod brasses, passenger car brasses, including all other castings made of No. 1 grade metal, which is principally new; this is used to produce No. 2 metal. No. 2 scrap comes from freight car brasses, general locomotive scrap, etc., and all castings made from No. 2 metal, and is used to produce No. 3 metal.

The grading of our own scrap is very simple, for you already know what it contains and just what proportions of the better quality of metal necessary to tone it up to its assigned grade. It is the foreign scrap that requires the most careful study, as you all know that the manufacturers of cars and engines differ in their mixtures and uniformity, but with the aid of your chemist each maker's brass can be graded and put in the best possible use, according to its richness.

We thus far, with but one exception, prefer to work our own scrap car brasses, and without exception our own engine scrap, and for this reason I would advise our company, should they at any time order new cars, to claim the right to furnish the brasses for them, notwithstanding the cost of shipping, etc.

Then comes the question of labor. In a small foundry like ours it is necessary that every man must work. We not only have a good foreman who knows how to work his men, but one who knows how to work himself. When men are well used, fairly paid and have a good shop to work in they will endeavor to turn out their work in good shape and at the same and perhaps less cost than they would in the general run of brass foundries, most of which are more or less uncomfortable and unsteady.

When making estimates on first grade locomotive brass, in 1892, I used to figure it at 25 cents. The first year of our own manufacture it was 14 cents, and now I figure it at 12½ cents.

I trust that I have been able to throw a little light on the subject, feeling assured that it is a financial success, a betterment in metal, and a more economical use of scrap, to say nothing of the conveniences.

Mr. Hickey, of the Northern Pacific, said that after some experience in making brass castings on his road, the plan was abandoned on account of the expense of the organization necessary to make them, and that such castings were now purchased from an outside concern which had specially favorable conditions of manufacture.

Mr. Bryan, of the Duluth & Iron Range Railroad, said his experience had been favorable to producing both brass and iron castings in a foundry operated by the road. In this case the superior quality of the product and promptness in supplying demands as well as the possibility of reducing the stock carried were considered as of more importance than low cost of the castings.

Mr. Tonge, of the Minneapolis & St. Louis Railroad, believed that it was desirable for large roads to operate brass foundries, but did not think that this method would pay upon roads where the demand for castings was small.

Mr. Pattee, of the Great Northern Railway, said that from a foundry which cost $2,500 to build a saving of $3,000 was obtained in one year. The foreman did the major part of the better class of work and the rest was done by cheap help. He found that he was able to make brasses for a difference of little less than two cents per pound between the cost of old and new castings, which was a more favorable price than he had been able to obtain from outside foundries.

Mr. McIntosh, of the Chicago & Northwestern Railway, stated that this road had been able to obtain considerable profit by making all the brasses used on the line. The advantage, as to price, was found to be about five cents in favor of doing the work in the railroad foundry.

Street railroad mail cars are now operated on schedule time on some of the lines in Philadelphia, and the residents along the routes are invited to drop letters in the cars as they pass, thus saving from two to four hours over the time required for delivery of city letters when they are deposited in the street boxes.

The New York & New England Railroad was sold at Hartford, Conn., July 9, to a representative of the reorganization committee, for $5,000,000. The completion of the reorganization will probably take several weeks. It is generally believed that the control of the New England road is now in the hands of Mr. J. P. Morgan and interests associated with him.

The Nantasket Branch Electric Cars.

We published in our last issue some illustrations and a short description of the new electric cars built for the Nantasket branch of the N. Y., N. H. & H. R. R., by the Barney & Smith Car Company. We give below some further particulars of these cars:

They are 50 feet 4 inches long over all, and 7 feet 10½ inches wide. They have a seating capacity for 96 people, counting six persons to each seat. The interior arrangement of the car is very similar to an open car, excepting that all of the parts are heavier. The cars are supplied with sliding bars along the sides for the protection of the passengers, and the platforms are supplied with swinging gates to keep the people off. The coupling and buffing arrangement is exactly the same as used on the New Haven road for its passenger coaches. The cars are equipped with the Westinghouse air brake, and are mounted on passenger car trucks with steel tired wheels.

Fatal Wreck on the Grand Trunk.

Another frightful wreck has occurred on the Grand Trunk Railroad. This road has been afflicted with more such wrecks during the last couple of years than any other American railroad. The latest was a rear end collision of excursion trains at Craigs Road, Quebec, July 9, at three o'clock in the morning. The first section stopped to take water, and the second section crashed into it while standing, the locomotive of the second section burying itself in the rear sleeping car filled with sleeping passengers, killing 13 persons, among whom were the engineer and fireman of the second section. Twenty-nine were seriously injured. The blame for the disaster is placed on the engine crew of the second section, who were supposed to have been asleep, as neither the bell or whistle was sounded, or steam shut off, or brakes applied on the colliding engine.

"Pat" Regan had a face on him that, as he had once remarked himself, was an "offince to the landscape." Next to his homeliness his poverty was the most conspicuous part of him. An Irish neighbor met him recently, when the following colloquy ensued. "An' how are ye, Pat?" "Moighty bad, intoirley. It's shtarvation that's shtarin' me in the face." "Is that so? Sure, and it can't be very pleasant for ayther of yez."

The Atchison, Topeka & Santa Fe is going to build a a new roundhouse and some shops at Arkansas City, Kan.

The Carlisle Mfg. Company, of Carlisle, Pa., is about to erect an addition to its car shops, 60 feet long and 70 feet wide.

A collision on an Argentine railroad at San Pablo, in the Province of Corrientos, July 11, killed 18 persons and injured 30 others.

The Chicago Great Western has begun the erection of new repair shops at Oelwein, Ia. The main shop is to be 90 feet wide and 700 feet long.

A stone was thrown through the window of a sleeping-car on the "Big Four" road on the evening of July 18, and narrowly missed killing ex-Governor J. B. Foraker, of Ohio.

The Chicago & Eastern Illinois has increased the wages of its employes 10 per cent. This affects those drawing $50 per month and over, and is a restoration of wages cut in 1893.

The Empire State express made an extraordinary run on July 13, covering the 149 miles between Syracuse and Albany in 149 minutes, including a stop of eight minutes at Utica.

On July 17, at Peoria, Ill., the heaviest rainfall in 40 years occurred. A thousand feet of track on the Peoria & Pekin Union Railroad was washed out, and other railroads entering the city suffered considerable damage.

Despatches from Paris dated July 26 report a railroad wreck near St. Brienc that day, by which 12 persons were killed outright and 50 others more or less seriously injured, some of them fatally. Eight carriages were wrecked. The train was drawn by two engines, the engineers and firemen of both of which were killed.

It has been reported that the Chicago & Northwestern had dispensed with the plan of suspending employees for infractions of the rules, but General Manager Whitman informs us that "the question has been discussed in our Superintendents' meetings in various ways, but nothing definite has been determined upon."

Nebraska railroad officials have just made a careful survey of the crop situation in that State. The yield of small grain this year will exceed by thousands of bushels any former year in the history of the State. The early corn is made, while the late corn is in the pink of condition. While there must be a vast movement of grain, the move ment of range cattle promises to be equally great.

The new shops of the Southern Railway., at Knoxville, Tenn., are now in full running order. They will do the general repair work of the Western lines of the system, and will employ about 800 men. The new shops of this company at Atlanta, Ga., will now be pushed to completion, as a recent decision of the Georgia Supreme Court settles the title to the necessary real estate in favor of the company.

Master Mechanics' Association Convention.

(*Continued from page* 111, NATIONAL CAR AND LOCOMOTIVE BUILDER, *for July.*)

Fire Kindlers.

Your Committee on Locomotive Fire Kindlers reported fully last year on the oil devices then in use. A resolution was passed continuing the Committee for a year, and asking that they gather all the information and data possible on the subject. We can make no changes on our last report. Little or no change has been made in oil-kindling devices, but a large number of experimental devices have been tried; but, as a rule, without marked success.

The plan of introducing the oil fire under the grates was tried, with the belief that this was the proper place to light coal. Heavy loss was caused by radiation from the ash pan, and the fire was not kindled so well as when fire was applied above the fuel. Oiled waste has been tried, and independent kindlers; using a can of oil flowing by gravity to the kindler; but such devices are cumbersome, require more labor to handle, and increase the fire risks.

The cost of compressed air has never been charged to oil-kindler expenses, and we think it need not be for purposes of comparison with wood, for the reason that there are expenses in handling wood fuel, not charged against it as fuel, that more than compensate for the cost of compressed air. By experiment it was found that a standard main air reservoir containing 15,800 cubic inches of air at 70 pounds pressure kindled three fires in ordinary eight-wheelers, using about 300 pounds of fuel each; this goes to show that the amount used is not excessive.

The officials of the Baltimore & Ohio, the Chicago, Rock Island & Pacific, the Wisconsin Central, the Burlington, Cedar Rapids & Northern, and the Minneapolis & St. Louis have made numerous experiments to determine the efficiency in time and cost of kindling fires with oil and wood under all kinds of conditions. Records of these trials, covering, as they do, a full year (61,768 fires), all kinds of weather, all kinds of locomotives, the fluctuations of oil prices, etc., can be taken as pretty correct, and they show that the cost of kindling locomotive fires by oil is less than two cents per fire.

Of the several devices tried, only one has come into anything like extended use. The Leslie kindler is in use in 407 stalls, and in course of installation in 428 more. All of the tests referred to in our tables were made with this device. The Smith kindler is in use on the Illinois Central, but we have been unable to get any data as to its work, other than that it is doing well. That the oil kindler is past the experimental stage seems proven. There is no doubt of its efficiency. It saves labor and time, reduces fire risks, reduces hauling of fuel for kindling and storing and handling. Its cost—about $20 per stall—is easily saved in a year in economy over wood.

The Le Bel kindler is in use on the Canadian Pacific, the Fitchburg and the Vermont Central. It is made up in the form of bricketts, 6 inches long by 2 inches wide and 1½ inches thick. It is composed principally of rosin, fuel oil and sawdust. From four to ten pieces are used to light a fire, the smaller number being enough for ordinary eight-wheeled engines. This kindler costs between one and two cents per stick; comes in boxes of 100, and, of course, requires no plant. Being inflammable, it should not be stored in buildings on account of fire risks.

JOHN HICKEY, J. O. PATTEE, GEORGE D. BROOK, W. T. REED, JOHN A. HILL.

Mr. Bushnell: Our experience with oil kindlers has been very satisfactory.

Mr. Herr: It is questionable whether there is still more work for the committee. On the Northwestern road we have been using the method of kindling fires with oil extensively, but have superseded it, in a number of places, by using dirty, oily waste, and are finding that method very satisfactory as far as we have gone. It has only been in use a short time.

Mr. Pattee: The experiments, so far as we are concerned, simply show the fact that it depends entirely on location and the price of wood as compared with coal. In locations where wood is very scarce and coal is cheap something can be used to very great advantage in preference to wood. On the other hand, where wood is cheap and coal expensive, the wood was found to be better.

Mr. Atkinson: I do not think it is ever urged that the kindler is the part that makes the steam; you must ignite a body of coal to a certain temperature.

Mr. Brown: We take it for granted that the roads using kindlers are using soft coal, which readily ignites. We are using hard coal, and I do not think we could obtain very great benefits from such a little flame in the first place. Our experience during the past 28 years has been lighting with wood in the usual way, covering it slightly with coal, and allowing it to ignite as easily as possible, so as not to increase the heat on the plates too suddenly. Previously live coals were used for starting the furnaces.

Best Material and Specifications for Locomotive Boiler Tubes.

Circular letters were issued to members of the Association, asking for information, based on experience, in the use of boiler tubes made of different materials now in use, with a view of embodying in this report the views of those most interested. From replies received we find that all prefer iron and recommend it as the best material for locomotive tubes. The objections offered to the use of steel tubes are that they are more liable to "pit" and become eaten out sooner than iron, and in localities where water is bad there is greater difficulty in keeping them tight. The ends soon become hardened from frequent rolling and calking, which makes them so brittle that they break off at the firebox end.

Some master mechanics report trouble from imperfect welds in the use of steel safe ends with tubes, and vice versa. This arises from the fact that the melting point of steel is materially lower than that of iron, so that when iron is brought to the welding heat, steel is burned. Steel safe ends may be perfectly welded to steel tubes, and iron ends to iron tubes; but when tubes and ends of different materials are joined, imperfect welds will result. It is, therefore, very important that tubes and safe ends be of the same composition. In recent years it appears that manufacturers have attempted to make a specialty of steel tubes, and the market is supplied with steel tubes, tubes with part steel at center of the section, tubes with one side of steel, and tubes are offered, made by various processes, of both iron and steel.

The universal opinion of members of this Committee is that best results are obtained from the use of tubes and safe ends of the same material, and all agree that both should be of the best material obtainable. With these points in view, and being unable to report favorably on either steel or semi-steel tubes, we recommend "knobbled hammered charcoal iron." The most approved method of making this iron is to smelt the ore in a blast furnace, using charcoal as fuel. The pig iron formed is then placed in a refining furnace and boiled with charcoal. When it becomes sufficiently "cooked" or refined, it is run into a cast-iron trough about 15 feet long by 20 inches wide and 4 or 5 inches deep. The "cinder" or "slag" then comes to the surface, and when water is placed upon the hot metal, is loosened, and may be scraped off. The iron in the trough is then broken in small pieces and placed in a sunken furnace with charcoal, and the cold blast applied. This is called the "knobbling furnace," and here it again undergoes the refining process. When the iron thickens so as to allow of its being rolled into large lumps or balls, it is placed under a powerful hammer and thoroughly hammered to give it coherence and drive out the liquid "slag." This also forms it into blooms, which are reheated and rolled into "break downs" or slabs, and these are re-piled and rolled into tube strips or "skelp iron." It is more expensive than iron made by other processes, but it has been demonstrated that tubes made from it will last much longer.

In preparing the specifications and tests, we had under consideration the tensile strength and elongation which good tubes should stand; but after considerable correspondence with members who have testing machines in laboratories connected with their shops, it was decided that such a test would be of little importance, and it is doubtful if greater additional protection would be afforded railway companies against the purchase of bad material by its adoption.

The tests recommended are all very simple, and can be made at any shop or at the tube works without the use of elaborate or expensive apparatus. Both specifications and tests were adopted by the committee after careful consideration and consultation with members of the Association and tube manufacturers, and we are informed by the latter that there will be no difficulty whatever in making tubes to comply.

In furnishing dimensions, it was deemed best to give the limit of weight in pounds to the foot for the different diameters and gages of tubes in general use, as it is believed that this stipulation will prevent the acceptance of tubes rolled lighter than the gage ordered. As the measurement of tubes can only be made at the ends, the thickness as shown by wire gage is somewhat unsatisfactory; whereas, if both wire gage and weight are taken into account, full weight tubes will be assured.

The physical tests are given to show the quality of the material used. Inferior tubes have been manufactured with a layer of good iron on the outside and common iron inside. A section of such a tube 1¼ inches long can be placed on end and hammered down solid, showing but slight splitting and no transverse cracks; this is the well known way of testing tubes, but it is clear that this test will not show the quality of the inner layer, the ends invariably turning inward. These facts, combined with the knowledge that in the "hammering down" test, the fibers of the iron are bent in the direction contrary to the manner in which tubes are turned over on a tube sheet, have led the committee to suggest that better results may be obtained by planing strips lengthwise from tubes and turning over the ends in opposite directions, thus testing both inside and outside layers.

In the second section under this heading we give what may be denominated the "pin test." It has been demonstrated that no tube of common iron will stand the strain of this most crucial test.

At the recommendation of several members of the association, we give directions for making an "etching test," which will, we think, be found of great value in determining the kind of material in tubes, and for the information of members who may not be familiar with the process of etching tubes, we have reproduced some of the etchings made under the direction of the committee, showing the appearance of iron and steel tubes.

The committee wishes to thank the members of the Association for information furnished, and for many suggestions which we have found of great value in the preparation of this report and the accompanying specifications.

SPECIFICATIONS AND TESTS FOR LOCOMOTIVE BOILER TUBES.

Extra Quality Material.—Tubes to be made of knobbled hammered charcoal iron and lap-welded.

Dimensions and Weights.—Tubes 2 in., outside diameter.
No. 13 B. W. G. shall weigh at least 1.91 lbs. per foot.
No. 12 B. W. G. shall weigh t least 2.17 lbs. per foot.
No. 11 B. W. G. shall weigh at least 2.38 lbs. per foot.
No. 10 B. W. G. shall weigh at least 2.64 lbs. per foot.
Tubes 2¼ in., outside diameter.
No. 13 B. W. G. shall weigh at least 2.16 lbs. per foot.
No. 12 B. W. G. shall weigh at least 2.46 lbs. per foot.
No. 11 B. W. G. shall weigh at least 2.70 lbs. per foot.
No. 10 B. W. G. shall weigh at least 2.99 lbs. per foot.

Surface Inspection.—Tubes must have a smooth surface, free from all laminations, cracks, blisters, pits and imperfect welds. They must also be free from bends, kinks and buckles—signs of unequal contraction in cooling or injury in manipulation—and must be of uniform thickness throughout, except at weld, where one gage number additional thickness will be allowed, perfectly round and cut to exact length ordered.

Physical Tests.—1. Strips one-half inch in width by six inches in length, placed lengthwise from tubes, after being heated to a cherry red and dipped in water at 80 degrees Fahrenheit, shall bend in opposite directions at each end, as shown in Fig. 1, without showing cracks or flaws; and when nicked and broken these must show a fracture wholly fibrous.

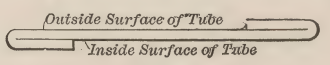


FIG. 1.

2. Sections of tubes 12 inches long—five inches of which shall be heated to a bright cherry red in daylight—when placed in a vertical position, and a smooth-turned tapered steel pin at a blue heat is driven in, by "lap" blows with a 10-pound sledge hammer, must stretch to one and one-eighth times their original diameter without split or crack. One tube to be tested, as required in paragraphs 1 and 2, in each lot of 250 tubes or less.

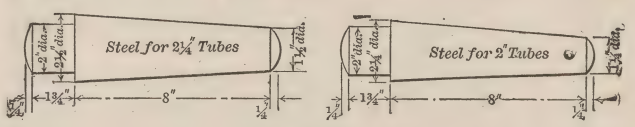


FIG. 2.

The sketches in Fig. 2 show dimensions of steel pins to be used for 2 inches and 2¼ inches O. D. tubes.

3. Tubes must expand, turn over tube plate and bend down without flaw, crack or opening at weld.

Hydraulic Test.—Each tube must be subjected, by the manufacturer, to an internal pressure of 500 pounds to the square inch.

Etching Tests.—In case of doubt as to the quality of material, the following test shall be used, viz.:

A section of tube turned or ground to a perfectly true surface, polished with fine emery paper, and free from dirt and grease, to be suspended in a bath of

Water ..... 9 parts.
Sulphuric acid ..... 3 parts.
Muriatic acid ..... 1 part.

The bath should be prepared by placing the water in a porcelain dish, adding the sulpuric acid and then the muriatic acid. Chemical action is allowed to continue until the soft parts are sufficiently dissolved so that an iron tube will show a more or less finely ridged surface, with the weld very distinct; a steel tube will present a homogeneous surface with the weld quite indistinct, and sometimes almost imperceptible.

General Requirements.—Each tube must be plainly stenciled "Knobbled Hammered Charcoal Iron" and "Tested to 500 Pounds," and tubes must be so invoiced. Each tube must also be subjected to careful surface inspection, as provided for above; and those measuring one sixty-fourth of an inch over or under the diameter ordered shall be rejected.

Failure of a single tube to pass any of these tests shall be cause for the rejection of the entire order. A. T. LAWES, W. L. GILMORE, R. B. REDDING, P. H. PECK, M. N. FORNEY.

Mr. McConnell: In some portions of the country the flues remain in 10 years, but west of the Missouri River the flues do not remain in the boiler more than 10 months. A good grade of charcoal iron tubes would answer the purpose as well in these boilers. It is customary on some divisions in the western country for the flues to be removed once every six months, and an expensive tube such as would come up to these specifications is not necessary. The recommendation of the committee which might do for the eastern portion of the country will not do for the western, where the water is bad and the flues cannot remain in the boiler.

Mr. Lawes: The committee has not taken into consideration the cost of the tubes. The committee was appointed to report on the best material and the prices quoted for these various tubes was not considered.

Mr. Roberts: If we adopt this report it still leaves the master mechanics to make requisition for such quality of tubes as they require. What we want is to get a tube that will stand the wear and a tube that can be applied and worked easily. When it comes to a question of labor in the application, and not question of the action of water on flues, I think the high-grade flue is an economical one.

Mr. Barnes: I do not see why this specification could not be adopted. We have one for boiler material which we adopted last year on trial. I do not see why we cannot go ahead on that basis with this.

Mr. Garstang: I think the committee have labored and done well. If we adopt this as a standard, it does not mean that members are obliged to use this particular kind of tube; but if he wants a first-class tube he has something to guide him in purchasing that tube. Until this report was made we never had a specification that would answer.

Mr. VAUCLAIN: What we want is a specification for boiler tubes of good quality, and competition will regulate the price. As we have had such happy results with the specification for boiler plates, it seems to me that this Association is not going to make a mistake by adopting this report as their standard, and if they do make a mistake, it is on the right side.

On motion of Mr. Barnes, the title of the specification was made to read "Specifications for Iron Locomotive Boiler Tubes of Extra quality."

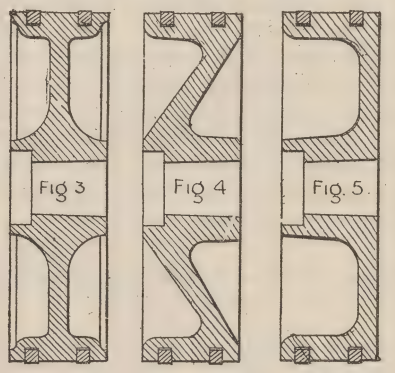
Pistons, Piston Rods and Fastenings.

PISTONS.

Inquiry has developed the fact that all pistons in current use, either in this country or abroad, may be broadly grouped under the three following heads:

The bull ring piston, as shown by Fig. 1; the box piston, as shown by Fig. 2; the single plate piston, as shown by Figs. 3, 4 and 5.

The illustrations are intended to show only the general type, as there may be considerable latitude in developing details to suit the ideas of the individual designer. We give below a brief statement of some of the characteristic features of several variations of each type.



The Bull-Ring Piston.—Pistons of this type all have the bull ring (otherwise called the T ring or the bearing ring), with a follower plate and bolts for holding the same in position.

In most cases the follower bolts are quite long and are screwed into holes in the spider arms. In a few cases, however, the follower bolts, instead of being screwed into the spider arms, are screwed into brass nuts which are previously inserted into the spider arms through lateral openings. Some of the designs received by the committee would seem to indicate that the bull ring is a close fit on the ends of the spider arms, while other designs indicate that a space is left between the inside of the bull ring and the ends of the spider arms, which space is subsequently filled with liners. It is uncertain whether liners are more commonly used between each spider arm and the bull ring, or whether they are used only on the ends of one or two spider arms at the bottom of the piston head.

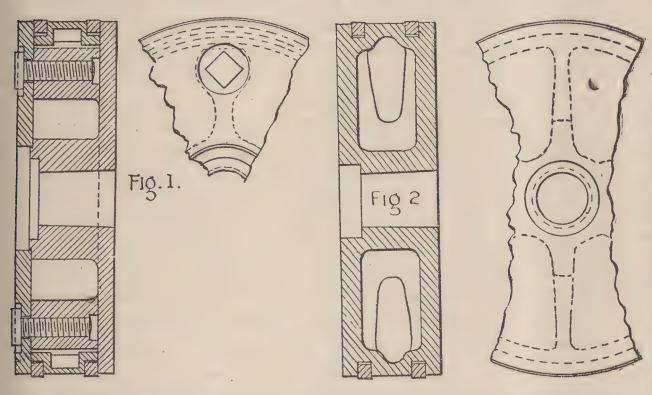
The Box Piston.—Pistons of this type are either cast with internal cord recesses or are made in parts (usually halves) which are subsequently fastened together. In pistons of all sizes, the Baldwin Locomotive Works has, to a certain extent, followed the practice of making the pistons in halves, cast iron or cast steel being used for the smaller sizes, and pressed or forged iron or steel for the larger sizes; the two halves of each piston being perfectly fitted, one to the other, and then held together by rivets. Where the piston body is made of steel or wrought iron, it is customary to heavily tin the outer rim where it has to wear against the cylinder walls. In all box pistons which are cast with internal cored recesses, it is necessary to leave some holes in either the side plates or the rim for the proper support of the core; these holes being subsequently filled with plugs which are usually of cast iron, but in a few cases (particularly where used in the rim of the piston) of brass.

The Single Plate Piston.—The feature which is common to all single plate pistons is that they have no internal cored recesses, but are solid metal throughout. They are, however, made in three forms, as per Figs. 3, 4 and 5, which, for convenience, may be designated as Central Plate, Inclined Plate and Side Plate. (They are also sometimes designated by the letters T, Z and U, which the three sections severally resemble).

The advocates of the bull ring piston claim for it that it is

absolutely the only form of piston which, when repaired, can be made at small expense to completely fill its cylinder and thus reduce lost motion and wear to a minimum. This is practically the only form of piston which permits the convenient use of the Dunbar sectional packing, which form of packing has many warm friends.

For the box piston the claim is made that it is simple, cheap, and has no loose parts; that it can be made in cast-iron of sufficient strength for usual diameters. It is claimed for the bull-ring piston and the box piston in common, that with pistons of these types the cylinder heads may be made in the simplest possible form, and the clearances between piston and cylinder heads are reduced to an absolute



minimum; also, that pistons such as these having internal air spaces embody the most practical forn of non-conducting construction, which operates to prevent the conduction of heat from the high-pressure to the low-pressure side of the piston.

The single plate piston is probably the form which best combines strength and lightness, which are acknowledged to be necessary features of pistons of large diameter, and particularly for pistons (whether small or large) of high speed engines, inasmuch as the weight of the piston (and the other reciprocating parts) is a minimum.

A question which has received some attention in different localities is whether it would pay to finish and polish the faces of every piston of whatever type (together with the inner faces of the cylinder heads), with the idea that such polished surfaces cannot as readily hold water of condensation as rougher surfaces can and that there would be a corresponding reduction of condensation when new steam was admitted to the cylinder and came in contact with such exposed surfaces. Even an experimental settlement of this open question would be complicated by the fact that it is practically impossible to make a smooth finish on the inside of the ports leading from the steam chest to the two ends of the cylinder, these ports being alternately occupied by live steam and exhaust steam.

No fixed rule seems to be observed in determining the relation of the width of the piston to its diameter, but in general it may be said that the best accepted practice in the matter of 20-in. pistons is to make them from 5½ to 6 in. wide on the face. It does not follow, however, that all pistons should be in the same proportion; for instance, the 30-in. piston used by Mr. Webb on the London & Northwestern Railway is only 5 in. wide across the face.

Some of the desiderata in a locomotive piston are strength, lightness, cheapness of first cost, cheapness of maintenance and renewal, minimum exposed surface, with reference to condensation, fewest parts possible that can work loose and knock out cylinder heads, and a good system of packing rings. We will not undertake to state these desiderata in the order of their importance, as that would have to be determined by considering the special conditions and circumstances of the expected service which the individual engine to which the pistons were to be applied was to perform.

PISTON RODS.

It is conceded that in designing a piston rod it is essential to keep down its size and weight as much as possible, and to provide reliable fastenings where the piston rod is secured to the piston and to the crosshead. The inquiries of the committee have led them to the conclusion that the taper fit for both ends of the piston rod is well supported by successful practice, and may be considered the standard arrangement. There are a considerable number of details which, however, may seriously affect the results in service. It seems to be pretty well proven that a square shoulder between the taper fit and the cylindrical portion of the piston rod (at either end) is a bad arrangement, as it localizes all bending strains at such a shoulder and invites fracture at that point. This is getting to be pretty generally recognized, and is overcome in either of several ways, the first and most obvious way being to introduce a large fillet in place of the square shoulder; the next step being to introduce a blunt taper in place of the square shoulder; the next step being to carry the original taper out beyond the piston or cross-head fit and until it merges into the cylindrical surface of the piston rod itself. Still another recourse is now being availed of to a considerable extent, and consists of reducing the section of the piston rod for a short distance outside of the cross-head fit (this is never done at the piston fit), which arrangement still further tends to relieve the cross-head fit itself from bending strains (and consequent tendency to get loose), and localizes those bending strains in a reduced cylindrical section, which is well adapted to receive and absorb them. This practice has been more extensively followed on the Michigan Central Railroad than any where else, and is said to have resulted in an almost complete freedom from broken piston rods. The same idea carried to a further extreme is to reduce the entire length of the piston rod between the piston fit and the cross-head fit to a diameter less than that of the large end of the taper fits themselves, but this entails the necessity of using a split stuffing box, which by many is considered to be very objectionable.

The usual and preferred method of fastening the piston rod into the piston is by a nut. Experience has shown that it is important that this nut should be sufficiently thick to prevent any possibility of its threads being battered by the blows on the piston, which action would, of course, result in the nut becoming loose and the fit between the piston and piston rod becoming impaired. A few roads use a brass nut in this place, claiming that a forged iron or steel nut gives trouble from rusting, and in some instances has to be split before it can be taken off. A very few roads dispense with the nut entirely; the end of the taper fit of the piston rod being riveted over into a countersunk recess in the faces of the piston itself. It is usual to take the further precaution in such instances of inserting a key through the hub of the piston and taper fit of the piston rod. This cannot, however, be successfully done except in the bull-ring type of piston. A modification of the present practice which has been considered and quite favorably received (but not yet reduced to practice so far as known to the committee) consists in simply forcing the piston onto the piston rod by hydraulic pressure; the fit being perfectly cylindrical as in the case of the fit between wheels and axles. The prevalent practice in the matter of securing the piston rod to the crosshead is to make use of a taper key. If the piston rod and key are well designed and proportioned, and made of the proper materials, this practice gives very successful results in service.

Packing Rings.—The most prevalent practice is to use cast iron rings, which are turned to a diameter larger than that of the cylinder in which they are to be used, and which subsequently have a piece cut out of them in order that they may thus be reduced to the desired diameter. The form of packing ring joint in most general use is the simple lap, while a few roads use a beveled joint and some a square joint. A few of the English roads use brass packing rings, but the almost universal American practice is to make these rings of cast iron. The practice varies as regards the sections of the packing rings themselves, and the following table has been prepared in this connection:

SECTIONS OF PISTON PACKING RINGS.

Party.	Diameter of piston	Number of rings.	Width of section.	Thickness of section.
	Inches.		Inches.	Inches.
Erie (compound)	16	2	1	9/16
Lake Shore	17	2	¾	1
Atchison, Topeka & Santa Fé	17	2	⅞	¾
London & Southwestern	17½	2	¾	½
Manchester, Sheffield & Lincolnshire	18	2	¾	½
Canadian Pacific	18	2	⅞	9/16
Baltimore & Ohio	18	2	¾	11/16
Union Pacific	18	3	½	½
Grand Trunk	18	2	¾	9/16
Pennsylvania Railroad	19	2	½	¾
London & Southwestern	19	3	⅝	½
Delaware & Hudson:	19	2	1	5/8
Chesapeake & Ohio	20	2	¾	¾
Richmond Locomotive W'ks.	20	2	⅞	11/16
Norfolk & Western	20	2	1⅛	5/8
Fitchburg	21	2	¾	¾
Erie (compounds)	27	2	1	⅞
Old Colony (Dean)	29	2	⅞	⅞
London & Northwestern	30	2	1	7/16

CONCLUSIONS.—The conclusions of the committee are briefly that for pistons of moderate diameter and for use in slow speed engines, there is an open choice between the bull-ring form and box form, while for pistons of any diameter, if for high-speed engines, the single plate type presents the important advantages of lightness, combined with strength. In piston rod fastenings the taper fit with nut at the piston end and key at the crosshead end seems to be the arrangement which is justified by the best practice. The tapers which are in current use vary between the extremes of ⅜ inch in diameter in 12-inch length to 1½ inches in diameter to 12-inch length, while a fair mean representing average practice may be considered to be 1 inch in diameter in 12-inch length. R. H. SOULE, W. H. THOMAS, WILLIAM SWANSTON, J. D. BARNETT, C. GRAHAM, JR.

Mr. Herr in discussing the report said:

We have a great deal of trouble in the breaking of piston rods on all classes of engines. A year ago while in Germany I took occasion to investigate this matter as thoroughly as I was able to do in the shops I visited. I could not find that they had any trouble with broken piston rods. Instead of making the rod as we do, with the tapering end that fits into the cross-head the small part—the part subjected to the most severe strains—they make it the largest part. To do this with our practice would entail two split stuffing boxes and split packing rings. They use almost exclusively the hemp packing. They fit the key carefully without sharp corners, and use very large fillets between the end of the rod and the body, which is considerably smaller than the end of the rod. Our practice of going to large piston rods as breakages occur is objectionable, not only from the standpoint of increasing the dead weight of the reciprocating parts, but also from the fact that it detracts just that much more area from the back side of the piston. It makes the engine not only less powerful, but less steady in its movements.

Mr. Forsyth: This report is a good introduction to the subject; and it should be continued, and the next report accompanied with detail drawings of large pistons, the details of the pistons rings and the fitting of the piston rods to the piston; and also the piston rod to the cross heads. Mr. Herr refers to the practice in Germany. That will not be of much benefit to us, because their experience has been largely with low speeds They do not run their fastest trains much over 40 miles an hour. They are about in the condition as to speed that we were 20 years ago. I do not think the enlargement of the piston fit in the cross head is necessary, for the reason that in recent years, to my knowledge, we have not broken any piston rods in the smallest section through the keyway. We have been troubled with breakage of piston rods of large diameter, both with the Laird cross head and with the wide spread guides, which is a balanced cross head. I think the reason is largely, if not solely, due to the shoulder on the piston rod. With piston rods with shoulders we have obtained only about 75,000 or 80,000 miles before they begin to crack and are taken out, while with piston rods with this shoulder entirely removed and the plain piston rod turned down with the taper, we have obtained double that mileage. They are still in service, and we do not expect them to break. I do not think it is a matter of quality of material, because we have obtained the best quality of iron and steel, and have had them break in about the same time. They should be fitted without the shoulder.

It was moved that the subject of piston rods and allied parts be made one of the subjects for a report next year. Carried.

Standard Sizes for Pamphlets, etc.

An exhaustive report was made by a committee of the Master Car Builders' Association and its recommendations were adopted in June, 1894. Your committee has reviewed this report and believe it will be in the interest of the Master Mechanics' Association and others to adopt the same general dimensions with the exception of the postal card. We submit the following for the Association's standard:

Postal Card Circulars.—1. 3½ by 5½ inches.

Pamphlets and Trade Catalogues.—2. 3½ by 6 inches. 3. 6 by 9 inches. 4. 9 by 12 inches.

Specifications and Letter Paper.—5. 8¼ by 10¾ inches.

In reference to sizes 2, 3 and 4, 3½ by 6 inches, 6 by 9 inches, 9 by 12 inches: These sizes may be folded, without much waste, from stock paper 25 by 37 inches. The size 9 by 12 inches will go into a compartment or drawer 10 by 12⅝ inches, and by dividing it with a tin partition, the 6 by 9-inch catalogues can be filed. By dividing it into four compartments the 3½ by 6-inch catalogues can be accommodated. These small compartments would also take the United States postal card of 3½ by 5½ inches. The No. 2 size is a convenient pocket size.

5. For specifications and letter paper 8¼ by 10¾ inches was selected, as it can be cut from folio size 17 by 22 inches.

GODFREY W. RHODES, EDWIN W. HERR, ALLEN COOKE, *Committee.*

The election of officers was as follows: R. C. Blackall, President; R. H. Soule, First Vice-President; P. Leeds, Second Vice-President; Angus Sinclair, Secretary; O. Stewart, Treasurer.

Mr. Blackall's election to the Presidency was more unanimous and enthusiastic than is usual, even in this association, and it proved his universal popularity with the members, and the high esteem in which he is held. Of 99 votes cast all but one was for him. On being installed in office Mr. Blackall said:

"Gentlemen, your electing me to the presidency is but a continuation of the many courtesies I have received from you in the past. There is no man but who might feel justly proud of having his name registered on the roll of honor which records the officers of this association. I am deeply sensible of the responsibility of the position. A position of trust is always a position of labor; and I would bespeak of you the same courtesy and co-operation that has been extended to my predecessor. Gentlemen, I thank you." (Applause.

American Railroad Statistics.

The seventh statistical report of the Interstate Commerce Commission shows that the total railway mileage in the United States on June 30, 1894, was 178,708.55, an increase during the year of 2,247.48 miles. The increase during the previous year was 4,897.55 miles.

On June 30, 1894, the total number of locomotives was 35,492, an increase during the year of 704. Of these, 9.893 were passenger locomotives; 20,000 were freight locomotives; 5,086 were switching locomotives; and 513 were unclassified. The total number of cars reported was 1,278,078. Of these, 33,018 were in passenger service; 1,205,169 were in freight service; and 39,891 were caboose, derrick, gravel, officers, pay, and other cars in the companies service. These figures do not include cars owned by shippers or private individuals. The increase in the number of cars during the year was 4,132, as against an increase of 58,854 during the previous year. This falling off in the ratio of increase is due to the fact that the railways had during the year destroyed a large number of old, wornout cars. The number of passengers carried per passenger locomotive was 62.639, and the passenger miles per passenger locomotive were 1,444,400. The number of tons carried per freight locomotive was 31.909, and the ton miles per freight locomotive were 4,016,755. During the year 1,579 locomotives and 30,386 cars were fitted with train brakes, and 1,197 locomotive and 34,186 cars were fitted with automatic couplers.

The total number of railway employees on June 30, 1894, was 779,608, a decrease, as compared with the number on June 30, 1893, of 93,994, or 10.76 per cent. This is a smaller number employed than in any year since 1890. This decrease is, of course, due to the heavy falling off in traffic and the endeavor of the railways to economize. On the basis of four persons being dependent on each wage earner, it shows that over one-third of a million of people have been deprived of their regular means of support. The class of employees showing the greatest decrease are trackmen, the decrease for this class being 29,443, or 16.34 per cent.; the next largest decrease is 19,890, or 18.91 per cent. for laborers and other unclassified employees.

A new feature in this report is a table giving a comparative statement of the average daily compensation of the various classes of railway employees for 1892, 1893 and 1894. For 1894 the average daily compensation was, for general officers, $9.71; other officers, $5.75; general office clerks, $2.34; station agents, $1.75; other station men, $1.63; enginemen, $3.61; firemen, $2.03; conductors, $3.04; other trainmen, $1.89; machinists, $2.21; carpenters, $2.02; other shopmen, $1.69; section foremen, $1.71; other trackmen, $1.18; switchmen, flagmen and watchmen, $1.75; telegraph operators, $1.93, and employees of floating equipment, $1.97.

During the year 1,823 railway employees were killed and 23,422 were injured, as compared with 2,727 killed and 31,729 injured in 1893. This marked decrease in casualty is in part due to the decrease in the number of men employed, and the decrease in the volume of business handled. The increased use of automatic appliances on railway equipment also may have rendered railway employment less dangerous, and it may be that the grade of efficiency of employees has been raised.

The number of passengers killed was 324, an increase of 25, and the number injured was 3,304, a decrease of 195. Of the total number of fatal casualties to railway employees, 251 were due to coupling and uncoupling cars, 439 to falling from trains and engines, 50 to overhead obstructions, 145 to collisions, 108 to derailments, and the balance to various other causes not easily classified. To show the ratio of casualty, it may be stated that 1 employee was killed out of every 428 in service, and 1 injured out of every 33 employed. The trainmen perform the most dangerous service, 1 out of every 156 employed having been killed and 1 out of every 12 having been injured. The ratio of casualty to passengers is in striking contrast to that of railway employees, 1 passenger having been killed out of each 1,912,618 carried, or for each 44,103,228 miles traveled, and 1 injured out of each 204,248 carried, or for each 4,709,771 miles traveled.

A Pacific Cable.

The project to lay a cable across the Pacific Ocean is announced as soon to be accomplished. The proposed route is from Auckland, N. Z., to Norfolk Island, in the South Pacific, 415 miles: Norfolk Island to Fiji, 1,002 miles; Fiji to Fanning Island, 1,715 miles, and from there to Vancouver, 3,242 miles. The total length will be 6,484 miles, almost three times as long as the shortest transatlantic cable. The estimated cost is $7,585,000. It is proposed to have a number of cables connecting with the main one in the Southern Hemisphere, the principal connection to be between Auckland and Sidney, N. S. W.

Personal.

Mr. W. E. Griggs, General Manager of the Jamestown & Lake Erie road, has resigned.

Mr. J. C. Hoover, Purchasing Agent of the Columbus, Sandusky & Hocking has resigned.

Mr. J. B. Dorsey, for several years Master Mechanic of the Ohio River Railroad, has resigned.

Mr. S. D. Lake has been appointed General Superintendent of the Port Jervis, Monticello & New York.

Mr. F. H. McGee is appointed Master Mechanic of the Baltimore & Lehigh Railroad, vice W. L. Guyton, transferred.

Mr. James Smith has been appointed Master Mechanic of the Gulf, Beaumont & Kansas City, with office at Beaumont, Tex.

Mr. T. W. Peeples, Master Mechanic of the Manhattan Elevated Railway, of New York City, has resigned on account of poor health.

Mr. Edward K. Howes, formerly Purchasing Agent of the Wisconsin Central, died at North Greenfield, Wis., June 22, aged 59 years.

Mr. James K. Geddes, General Manager of the Bellaire, Zanesville & Cincinnati Railroad, has been appointed Receiver af the company.

Mr. W. E Roberts has been appointed Master Mechanic of the Litchfield, Carrollton & Western, succeeding Mr. George W. Lipscomb, resigned.

Mr. William Thornburg has been appointed General Manager of the Columbus, Sandusky & Hocking. He has assumed the duties of Purchasing Agent, also.

Mr. M. McNally, Assistant Master Mechanic of the Manhattan Railway, New York city, has been appointed Master Mechanic, vice Mr. T. W. Peeples, resigned.

Mr. A. A. Jackson, formerly General Superintendent of the New York & New England, died at his home in Norwood, Mass., on July 8, of heart disease, at the age of 64.

Mr. T. A. Switz, Purchasing Agent of the Minneapolis, St. Paul & Sault Ste. Marie, has been appointed Assistant to the General Manager. He continues as Purchasing Agent.

Mr. Hiram A. Blood, formerly President of the Cleveland, Canton & Southern and Columbus & Eastern Railroad Companies, died at Fitchburg, Mass., recently, aged 62 years.

Mr. George W. Bartlett, formerly General Superintendent of the Buffalo, Rochester & Pittsburg, has been appointed General Manager of the Centralia & Chester, a line in Illinois.

Mr. Joseph W. Preston, formerly General Manager of the Millen & Southern, has been appointed General Manager of the Middle Georgia & Atlantic, with headquarters at Atlanta, Ga.

Mr. J. H. Jones, General Superintendent of the Ulster & Delaware, has resigned, and has been appointed manager of the Champion Steam Joint Reamer and Grinder Company, of Rondout, N. Y.

Mr. C. D. Owens has been elected Vice-President and General Manager of the Atlantic & Danville, with office at Norfolk, Va. Mr. Owens was for 10 years Traffic Manager of the Plant system.

Mr. Nicholas Monseratt has been appointed Receiver of the Columbus, Sandusky & Hocking Railroad. He was formerly, for many years, Vice-President and General Manager of the Cleveland, Akron & Columbus road.

Mr. George Whaley, of Paris, has been elected Vice-President and General Manager of the Panama Railroad. Mr. Whaley has for several years been the Chief Mechanical Engineer of the Western Railroad of France.

Mr. D. T. Forbes has been appointed General Superintendent of the New York, Texas & Mexico and the Gulf, Western Texas & Pacific divisions of the Southern Pacific, with office at Victoria, Tex., vice W. S. Haskins, resigned.

Mr. T. G. Bush, heretofore Receiver of the Mobile & Birmingham Railway, has been appointed President and General Manager of the Mobile & Birmingham Railroad Company, under which name the company has be reorganized.

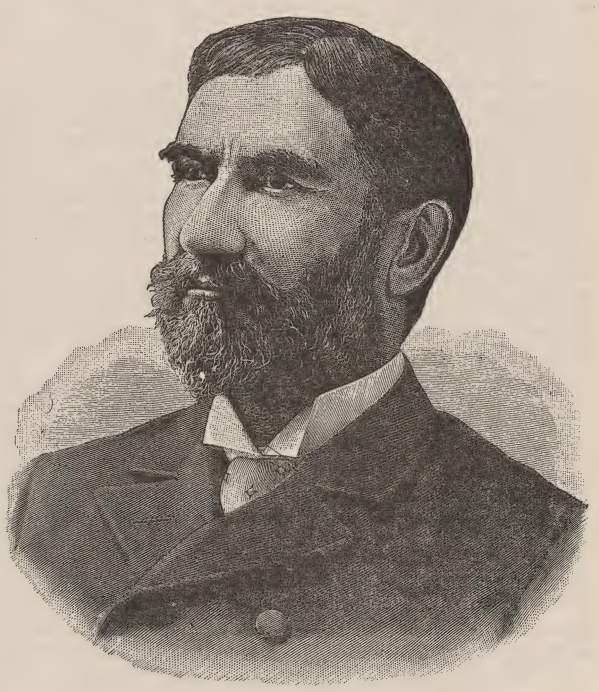
Mr. E. T. Haines has been elected Vice-President and General Manager of the Jamestown & Lake Erie Railway, with headquarters at Jamestown, N. Y., vice J. F. Workum, Vice-President and W. E. Griggs, General Manager, resigned.

Mr. W. W. Fagan, General Superintendent of the Kansas City, Memphis & Birmingham and the Kansas City, Fort Scott & Memphis roads, has resigned. He has been succeeded by Mr. J. H. Emmert, Division Superintendent of the Kansas City, Fort Scott & Memphis road.

Mr. E. E. Calvin, Superintendent of the Idaho division of the Union Pacific, has resigned that position to go to the International Great Northern as General Superintendent, his headquarters being at Palestine, Tex. Mr. H. E. Van Hoover, Assistant Superintendent under Mr. Calvin, will succeed him as Division Superintendent of the Union Pacific in Idaho.

Mr. Frank Thompson, First Vice-President of the Pennsylvania Railroad, returned home from a three months' absence in Europe on July 13. Mr. Thompson went abroad to secure a much needed rest, and visited France, Italy and Switzerland. Returning, he attended the International Railway Congress in London.

Mr. A. N. Towne, Second Vice-President and General Manager of the Southern Pacific Company, died suddenly at his home in San Francisco, July 16. Mr. Towne was one of the most widely known and highly respected railroad men in the world, not only in consequence of the responsible position he held but as the natural result of his ability, fairness and high character. He leaves many friends to regret his untimely taking off, and few if any enemies. The great railroad he managed so successfully, and the interests he faithfully served, have lost in him a sagacious officer. Mr. Towne was 66 years of age, and was quite well up to within a few hours of his death, which resulted from heart failure, induced by a previous attack of grippe five years ago. He was born in Charlton, Mass., May 26, 1829, and began his railroad career forty years ago as a freight breakman on the Chicago, Burlington & Quincy, on which road he rose to be Assistant General Superintendent, which position he resigned to become General Superintendent of the Central Pacific in 1869. He became General Manager of this road in 1882, and General Manager of the Pacific System of the Southern Pacific in 1885. Three years later he became, in addition to General Manager, Third Vice-President of that company, and in 1890 Second Vice-President.



ALBAN NELSON TOWNE.

Malleable Iron in Car Construction.

Some comment has been made recently in journals on both sides of the water on the extent to which gray iron is being superseded in car construction by malleable iron and cast steel. In a recent central western contract for cars, a large amount of malleable iron work was specified. Other recent specifications leave out cast iron altogether Prices of both malleable iron and steel have fallen very much in the last few years, and the manufacturers of malleable castings can duplicate almost any cast-iron work about a car, in malleable iron at 50 per cent. of the weight of the gray iron. This enables him to offer to railroad companies malleable castings to take the place of gray iron, at a cost to them somewhat less than that of the gray iron castings. The weight of the gray iron castings cannot be reduced without danger of breakage, and so the car owner finds it to his interest to use a material which, though costing more per pound, costs less per casting. Steel comes into play where a greater strength is required than can be obtained with either of the other two metals.—*Iron Trade Review.*

Professor Otto Lugger, the State Entomologist of Minnesota, says that in Chicago County, of that State, there are 400 grasshopper killing machines, locally known as "hopper dozers," at work, and they are killing 8,000 bushels of grasshoppers a day.

The West Virginia & Southern Railroad, to connect with the Chesapeake & Ohio at Brownstown, W. Va., and traverse the Coal River region, has been chartered with a capital of $500,000, Joseph Renshaw, of Baltimore, being the principal stockholder. The Coal River drainage embraces 900 square miles of coal lands, all of which will be reached by 40 miles of the new road, which is expected to be completed to Coal River by January 1.

Address of the Prince of Wales to the Railway Congress.

In opening the fifth session of the International Railway Congress, the Prince of Wales said:

"I have to discharge to-day the very pleasing and the very important duty of declaring open the fifth International Railway Congress. I fulfill this duty on behalf of the Queen, who takes the greatest interest in the discussion of matters so closely affecting the welfare of her dominions. I do so on my own behalf, being glad of the opportunity of expressing my deep appreciation to the railway authorities, both at home and abroad, for their unfailing courtesy, and for the facilities which they have invariably afforded me on the occasion of my many journeys; and I perform it finally in the name of the great railway companies of this country, which are governed by a body of gentlemen of the highest ability and skill, who have asked me to be their spokesman on this occasion. I welcome to England, the birthplace of railways, the delegates from the Continental States and representatives, I think for the first time in the history of these congresses, from the two continents of America. Nearly seventy years ago the first railway that was constructed in the world, that between Stockton and Darlington, was opened. Five years later, in 1830, under circumstances of the most tragic kind, the first railway constructed under parliamentary powers and by money publicly subscribed, was inaugurated for passenger traffic between Manchester and Liverpool, and a ceremony of great interest and of great promise was marred by the lamentable accident which led to the death of Mr. Huskisson. In the 60 years which have since elapsed the development of railways has progressed throughout the world, and we have fitly met here to-day to show our interest in that celebrated industry which probably more than any other has enhanced the wealth and fostered the commerce of the world, and has tended to promote international friendship and universal good-will.

"The Railway Congress had its origin in 1885, when a number of leading railway men met at Brussels to celebrate the jubilee of the Belgian railways. Congresses have been since held in Milan in 1887 and in Paris in 1889, and the last congress, which assembled in St. Petersburg in 1892, was made memorable by the splendid hospitality and great encouragement given to it by the late lamented Emperor of Russia. I fear that we can not promise you the beauty of Italy, the gaity of Paris, or the magnificent reception which was accorded you on the last occasion upon which you met, but we can show you in Manchester, Liverpool, Cardiff and Crewe great centers of industry from which I hope you will be able to derive useful knowledge, and in which you will be able to see examples of the most beneficial work. I venture to say this even to our friends from the United States (a country which owns nearly half the railway mileage of the world) as well as the representatives of India and our colonies, who have helped forward the work of railway development with a speed and a success which I think deserve the utmost commendation. The programme of discussion, interesting as it is to those who, like yourselves, know how to appreciate technical details, will be of interest likewise to the public. You will be asked to consider not only the acceleration of passenger trains, but the means of promoting the comfort of passengers by the use of vestibule or corridor cars and by improved methods of heating and lighting. You will be also asked to consider arrangements for adding to the safety of the traveling public in such matters as signaling, interlocking, and the security of bridges. Electrical traction will present a field for your inquiries as yet comparatively unexplored, and on the subject of light railways you will be able to give us information on a question which is of growing interest in this country, and in the discussion of which our Parliament is at present engaged. To all these subjects you will bring not only profound knowledge, but a desire, I am sure, to exchange information which must be of advantage to all who take part in your discussions. Let me, in conclusion, once more welcome you on behalf of the Sovereign, the railway companies, and myself, and express the earnest hope that this congress may be the means not only of extending scientific and technical knowledge, but of founding also many pleasant and enduring friendships which will be valued in years to come."

The Chicago & Alton Railroad has presented the widow of Engineer Frank Holmes, who was murdered by train robbers at Carlinville, Ill., recently, with $2.500.

The Supreme Court of Missouri declared on June 18 that the law forbidding the discharge by corporations of employes who refuse to sever their connection with labor organizations is unconstitutional.

The Santa Fe has reduced the running time of its passenger trains between Kansas City and Chicago to 15 hours. This is the fastest time now made between the two cities.

The Escanaba, Frankfort & Northeastern Railroad, which was sold recently to Eastern buyers for $100,000 under mortgage, has been sold to the reorganization committee of the Teledo, Ann Arbor & North Michigan Railroad for $210,000, and will be operated as a part of the Ann Arbor system.

The Chicago, Peoria & St. Louis Railroad has been ordered to be sold before August 8. The sale is to be made under foreclosures by the Mercantile, Central and Metropolitan trust companies, of New York.

A man who tried to wreck a train on the Detroit, Grand Haven & Milwaukee Railroad on July 22, was sentenced to 30 years in states prison five days later, at Ionia, Mich.

The Chicago, Burlington & Quincy has sued Cook County and the city of Chicago for damages sustained at the time of the strike riots in 1894 for $150,000.

It has been reported that the Baltimore & Lehigh Railway is about to adopt electric motive power, but we are officially informed that there is no prospect of such a change.

Communications.

Feeding Locomotive Boilers.

Editor National Car and Locomotive Builder:

Referring to the article on page 106 of your July issue, entitled, "Locomotive Boiler Feeding," I will say that I not only heartily endorse the same, but all of your remarks made at the Master Mechanics' Convention, which I remember very well, and I was only sorry that the matter ended as it did, and that the discussion was choked off in the hour used for topical discussions.

Not to work an injector when an engine is shut off is but a relic of the Dark Ages, and reduces the capacity of all engines upon which this practice is followed. My instructions for years to our engineers, who are running fast passenger trains, where the capacity of the engine is barely sufficient to make time, is to set their injectors when starting from one station so that they will gradually lose water up to the time they shut off for the next. Of course, the practice varies somewhat among the men, but we have good runners here who intentionally lose a gage and a half, or two gages, of water when running 30 miles. While the engine is shut off running into the station, and while standing at the station, the injector continues at work replacing the lost water; and after starting, must lose water to the next station. I consider this the very best practice, and it is followed by our best runners. In fact we could not make time on some of our trains with certain classes of engines without doing it.

Our men are also instructed that when possible they should shut off their injectors when starting trains from a station, for about a minute only; as, otherwise, no matter whether the injector has been working while running into the station shut off or not, the engine will lose from 5 to 15 pounds of steam pressure, where the train is heavy. This is due largely to the fire being deadened somewhat for the want of draft, and in order to prevent this the firemen are instructed that unless the engine is blowing off, and even in some cases when it is, to keep the blower on. This causes all the circulation that is necessary, and keeps the fire in fairly good order.

I feel justified in saying that even upon the roads represented by men who seriously objected to this practice, many of their engineers follow it habitually; and I think if an investigation is made it will be found that the men doing so are their best men, and they make better time and have no more boiler repairs than those who do not. The principal difficulty I have is from the water getting cold at the bottom of the boiler (although the engine may be popping off) while waiting to go out on the run. Frequently, when trains are late, engines will stand from one to two hours, and firemen who have not been carefully guarding against it will find, when the engines pull out with their train, that they lose steam pressure very rapidly in spite of all their efforts to keep it up; thus showing that the water has cooled at the bottom while the engine was standing still with only a moderate fire. And to prevent this, our firemen are instructed to use the blower freely several minutes before they start with their trains. In my opinion, more harm is done to locomotive boilers standing around with steam up for several hours than is caused by working an injector on an engine when running shut off.

F. C. C.

Editor National Car and Locomotive Builder:

Your article on Locomotive Boiler Feeding in your issue of this month is very interesting to me, as I did not hear the discussion of this subject at Alexandria Bay. From the short experience that I have had in the injector business, I feel that it will pay mechanical officers to give special attention to the matter of locomotive boiler feeding and believe that if they would become interested and would have their men thoroughly instructed as to the proper workings of an injector, that there would be a saving of considerable money to their roads.

These facts were in view when the "Ohio' locomotive injector was designed, and it was constructed so as to use the least possible quantity of steam and secure the greatest efficiency and to give the machine the widest range possible. These qualities we felt were highly essential to the proper and economical feeding of a locomotive boiler, and the "Ohio" possesses them to an eminent degree.

FRANK W. FURRY, General Manager,
The Ohio Injector Company.

Editor National Car and Locomotive Builder:

I was present at the recent convention of the Master Mechanics Association when the question of locomotive boiler feeding was introduced in connection with the subject under discussion (the "Causes of Bulging of Firebox Sheets"). It came up so unexpectedly and in such shape that the impression created was no doubt not agreeable to the majority of members present. I agree with the statements you make on the subject in your July issue, but cannot refrain from making some comments.

The best practice to follow, according to my experience, is to maintain the water-level in the boiler constant at one point, as near as practice will allow. This will call for a constant feed with the injector and such regulation that no excessive increase will follow. The quantity of water injected in the boiler during what little time the engine comes to a halt in making regular stops is a gain. The heat of the fire will thus be utilized in heating the water, instead of escaping out of the safety valve. The injector should be so regulated as to avoid spasmodic efforts to feed the boiler. Any water put in the boiler while running without steam being used in the cylinders is a gain on the side of economy.

When you make the remark "Of course the injection could be continued until chilling did occur," I say: Not unless the engineer has been negligent and allowed the water in the boiler to become low and below the normal level, the consequent result of bad practice. In making fast runs with heavy trains, if the water in the boiler is allowed to deviate from the normal level, it will result in sure failure of making time. Only by constant care to maintain the normal water level can we meet the requirements.

R. H.

Boiler Feeding From An Engineer's Standpoint.

Editor National Car and Locomotive Builder:

The question discussed in the editorial on "Locomotive Boiler Feeding," in your July number has two sides. The side one takes in the argument depends on which point of view is taken when looking at the practice. If the care of the boiler only is to be considered that is one side: but when we come to consider the relative cost of operating an engine in regard to fuel consumption—the steaming qualities and the amount of work developed by the boiler and engine during any stated length of time—say between the times of general overhauling, that is the other side, and about the only side to take in these days of close calculations of getting the most work out of the motive power for the least money.

Some look at it from the same point of view to-day they did when *cold* water was pumped into a boiler. At that time it was conceded by engineers that it injured a boiler to pump a large supply of cold water in when the fire was not being forced into active combustion by the exhaust or the blower. However, the conditions are very much changed since then, boiler feeding being done by injectors, and the water goes into the boiler hot. But how hot? is the question. If, as stated, it is as low as 140 degrees, then that is a long way below the temperature of water and steam in a boiler at 140 pounds pressure, which is 360 degrees. I think there are instances where water goes into the boiler at that low temperature. It can be easily proved by shutting off the globe valve on boiler till just enough steam goes to injector to force the water and take up all the overflow, and the temperature of water in the delivery pipe will be found quite low. If this can be done when you are working injector so as to get a low temperature in delivery pipe it is liable to be so in regular service.

The other point of view, and the proper one, is to get a maximum amount of steam with a minimum amount of coal. Take for instance, an engine on a local passenger train that makes just steam enough to handle the train properly under favorable circumstances, and pump her only when you are working steam. She would pop if you shut off the injector when you shut off steam, and to avoid that the fire should be pretty well burned out. When you pull out again, and at the same instant set the injector at work, the fire does not commence to burn fiercely at the instant the throttle is opened, not until the engine has made a good many exhausts, during which time both the cylinders and injector are reducing the supply of steam. Then add to this the additional draft on the supply of heat generated by the fire, caused by heating the supply of fresh coal just put in up to the igniting point, and you need look no farther for the reason "The engine is a poor steamer. Steam drops back about 15 pounds when we pull out of a station." This practice requires a light fire when we shut off and run into a station and a heavy bright one when we pull out, a condition we cannot find in actual service.

Then, again, suppose we set the injector to throw the proper amount of water and leave it on continuously from beginning to end of trip, stops at intermediate stations and all. When starting out the fireman has to fire against the throttle, the injector, and a green fire all at once, and the exhaust does not have the same effect on the fire it will after the engine is moving 10 or 15 miles an hour. This practice will pull the steam pressure down worse than working the injector only when working steam through the cylinders. One test is enough to satisfy any observant man.

On the other hand, we will leave the injector at work when throttle is shut off, the good fire can be utilized to heat the water to the proper temperature, the engine does not necessarily pop, the fire can be of good thickness to pull out with, and the fireman is not obliged to "load her" instantly to keep from losing his fire. If a very long station stop is made, the injector can be shut off when water level is the proper height, but it should be shut off when throttle is opened to start the train. Then on starting out you have a full boiler of water, full pressure of steam, fire in good shape so that it can be uniform in amount both at and between stations; the steam pressure drops only a few pounds and picks up again in a few train lengths, when the injector can be started again at the proper feed to hold the water level exactly where it should be. If coal is to be burned to get the most work out of it the fire must be a proper thickness at all times, so thin coming into a station that there will be no surplus steam to blow off and no black smoke be given off around depots, and so thick pulling out that the heavy exhaust will not pull the fire off the grates or pull holes in it. Shutting off the injector for a minute or two when pulling out is one of surest ways to help a poor steamer over the road. If it helps the poor steamer make steam it will help the good steaming engine save coal.

C. B. CONGER.

Extension of "Discipline Without Suspension."

The improved plan of maintaining discipline on railroads without subjecting the employees at fault to suspension from service and consequent loss of pay, has been extended recently to several railroads, and the managers of several other roads, including the Kansas City, Fort Scott & Memphis, and the Chicago & Northwestern, are giving the plan careful and favorable consideration. General Superintendent T. F. Whittelsey, of the Ohio Central lines, in speaking recently of the new plan said:

"A year's trial has demonstrated its superiority, and we have arranged to continue it. All deviations from the rules or good practice are made the subject of a record bulletin over the signature of the division superintendent. Such bulletins are consecutively numbered and posted on bulletin boards at division terminals and are allowed to remain thereon 10 days, after which they are transferred to an adjoining file for reference. These bulletins state briefly (and without identifying the parties at fault) the occurrence, how it happened, who was at fault, and how it might have been prevented, adding such comment as is necessary to fully educate the men on the subject referred to. Each case which is bulletined is made a matter of record, and is charged against the record of each man participating. A man is given a double page for his record, and each man's record is open for inspection at any time by the man himself, but not by others. When a man's record gets voluminous, he is called to the office and given a chance to explain why such is the case. We make dismissals for an accumulation of bad record. The men are given credit for such commendatory service as may be entered on their record. In cases of intoxication, habitual drinking on or off duty, unjustifiable collisions, and any persistent violation of the general notice of our book of rules is punished with dismissal forthwith. We would not under any circumstances go back to the old plan of suspension. I believe that the new plan strengthens the relations between the railway company and its employees."

President Jeffery's Remarks on the International Railway Congress.

President E. T. Jeffery, of the Denver & Rio Grande Railroad, attended the International Railway Congress held in London in July, returned home earlier than most of the American representatives. Speaking of the Congress he said:

"The Congress was the largest that has ever been held in the history of railroading. There were 365 delegates present from England, America, Germany, France, Italy and every country in the world where there is a railroad. The Americans, representing the leading railroads of the Western hemisphere, numbered only about thirty, which we considered entirely too small a representation, considering that the United States have nearly half of the entire railroad mileage of the globe. The English and the Continental managers will learn a great object lesson when the International Congress is held in this country.

"The Congress was greatly surprised when Mr. John M Toucey, General Manager of the New York Central, read the speed record of the Empire State Express, which was far ahead of anything that the oldest and most experienced of the English or Continental railroad managers had ever heard of. The statement that 102 to 104 miles an hour had been made on special runs by steam trains astonished the leading men of the railroad world. Other figures were given by Mr. Toucey showing runs at sixty miles an hour for good average distances. Altogether, the Americans honored their country, carrying off the palm in many things. There was very little said about electric motive power, and no conclusion regarding it was arrived at."

Southern Pacific Ventilated Fruit Cars.

To avoid the expense of ice necessary in the usual methods of shipping California fruit to Chicago, the Southern Pacific Company has begun the use of ventilated cars without ice for this purpose, and the results so far have been satisfactory. By the present arrangement the fruit is shipped on through fast trains from Sacramento at midnight on the day it is picked, and the run to Chicago is made in about five days. The proper ventilation is maintained by keeping the cars in motion, so delays at yards and other places are avoided.

The cars are 34 feet long, and have double shutters at the top and bottom. These shutters are adjustable to regulate the ventilation and exclude sunlight, and are provided with wire netting to exclude dust. The cars have double walls which are paper lined, and have a bulkhead at each end arranged to leave necessary space for the free passage of air. Slats are placed lengthwise between the layers of fruit to facilitate the free circulation of air from one end of the car to the other.

A newspaper has just been started in London which is printed on a postal card. The first number has four illustrations, a comic tragedy, a few jokes and puzzles and some advertisements.

Air Brake Tests.

Following is the report of the committee on air brake tests, to the Master Car Builders' Convention at Alexandria Bay:

Air-Brake Tests.

In accordance with the plan outlined in last year's report, the committee on air-brakes now submits a "code" or "standard of efficiency for air brakes." This work has received not only the committee's most careful consideration, but is the result of frequent consultations and correspondence with those best versed in knowledge as well as the manufacture of power brakes.

The proposed standard of efficiency is as follows:

Condition of Tests.—Brakes will be tested on a rack representing the piping of a fifty 34-foot car train. All cocks, angles and connections will be as nearly as possible identical with those in train service. The rack shall conform to a blue print which is in the hands of the committee, which gives the proper fitting, piping dimensions of cylinder, auxiliary reservoirs, main reservoirs, engineer's valve, etc. Tests will be made with a uniform train pipe pressure of 70 pounds. Triples must be constructed so that they can be secured and operated on apparatus conforming to diagrams, Figs. 1 and 2 (see pages 165 and 167 of the 1892 annual report). To secure accuracy in measurement of time application and release tests, electrical recording apparatus will be used, arranged to give an indicator card in the fiftieth car. Tests shall be repeated three times under the same general conditions. The temperature at the time of the tests will be recorded. Triples shall be classified Nos. 1, 2, 3 and outlawed. In grading triples the reasons for their classification shall be given. The three essentials for a quick-action brake are as follows: Graduation, release, quick action.

RACK TESTS.

No. 1.—*Application Test (a) (Service).*—Brakes must show with full service application and 6 inches piston travel, a brake-cylinder pressure of 50 pounds. The minimum pressure must not be less than 48 pounds, nor the maximum pressure over 52 pounds. The test will be made with: (1) 4 inches piston travel. (2) 6 inches piston travel. (3) 12 inches piston travel. The necessity for the 4-inch and the 12-inch piston-travel tests will depend upon the character of the brakes being tested.

(The object of this test is to secure such proportion between the auxiliary reservoir and the brake cylinder as will give the desired maximum power in a full service application of the brake.)

No. 2.—*Application Test (b) (Emergency).*—Brakes must be applied on the fiftieth car with at least 45 pounds pressure with 6 inches piston travel in three seconds from the first movement of the engineer's handle. They should indicate at least 55 pounds in three and one-half (3½) seconds. The final maximum pressure in this test must not be less than 15 per cent. nor more than 20 per cent. above the pressure given by the same brake in full service application. This test will be made to determine that quick action is obtained in each case, with: (1) 4 inches piston travel. (2) 6 inches piston travel. (3) 12 inches piston travel.

(The object of this test is to secure as nearly as possible uniformity of pressures in the brake cylinders in an emergency application, and as nearly as possible a uniformity of time required to attain the pressures; to secure a mimimum length of stop, of shock and of trains parting.)

No. 3.—*Application Test (c).*—Commencing with the first car from the engine, the brakes of three successive cars, or less, if they fail to jump three, will be cut out until the fifth, sixth and seventh are cut out, the brakes in each case to be applied as per test No. 2. After the first series of three has been tested, in order to test the second series the first cars must be cut in, and so on. The quick action brake should pass the three cars cut out and apply on the fiftieth carin the same time as in test No. 2. Tests will be made with piston travel of 4 inches. In addition, at least two other applications shall be made with three successive triples cut out in any portion of the rack beyond the fifth car.

(In freight car sevice the most common method of remedying a defective brake is to cut the brake out; hence, it is essential that a limited number of brakes can be cut out successfully without destroying thequick-action feature.)

No. 4.—*Graduating Test (a).*—Seventy pounds' train pipe pressure having been secured, the following tests will be made: A reduction of 8 pounds in train pipe pressure. This should apply lightly the fifty brakes. A further reduction of 4 to 6 pounds. This should increase the braking power on all the brakes. A reduction to 30 pounds should equalize the pressure between the auxiliary reservoirs and brake cylinders. The piston travel in this test will be 6 inches.

(*b*)—One or more triples shall also be tested, having substituted for the brake cylinder a reservoir having the capacity of a cylinder with 8-inch stroke. The first admission to the cylinder should be made with a reduction of train pipe pressure not exceeding 5 pounds, each succeeding reduction should reduce the pressure in the auxiliary reservoir not to exceed 3 pounds, until full eqalization takes place. The pressure in the train pipe should not be more than 3 pounds lower than the equalized pressure in the brake cylinder and reservoir at full equalization.

No. 5.—*Test to Determine the Sensitiveness of the Service Valve.*—Three valves selected at random will be taken for this test and each tried separately. They will be tested on a train pipe representing a locomotive and one car, the engine and tender brake being cut out. A train pipe pressure of 70 pounds, having being secured, the air will be discharged as rapidly as it may through an opening in the engineer's valve of $\frac{2}{64}$ to $\frac{3}{64}$ (2 to $\frac{3}{64}$) inch diameter. Under this condition the service action must take place and continue to take place without any appearance of quick action (P. E., partial emergency) until the disk has been enlarged up to and including a $\frac{10}{64}$ opening.

(The object of this test is to insure the working of triples in "service" with practically the same reduction of air.)

No. 6 —*Test to Determine the Sensitiveness of the Quick-action Valve.*—The same three valves as in No. 5, or others selected at random, will be taken for this test and each tried separately. They will be tested under the same train pipe conditions as test No. 5. Engine and tender brake cut out. A train pipe pressure of 70 pounds having been secured, the air will be discharged as rapidly as it may through disc openings, as in the preceding test, increasing in diameter by $\frac{1}{64}$. Triples must not show a range of more than $\frac{3}{64}$ before full quick action is reached. Full quick action must not take place before $\frac{11}{64}$, but must take place when the opening is $\frac{14}{64}$.

(The object of this test is to check the introduction of triples which will cause a quick-action application when not wanted.)

No. 7.—*Test to Determine the Holding Power of the Brake in Service Application and Quick-action Application.*—Gages will be placed on the cylinder and auxiliary reservoir of the first, twenty-fifth and fiftieth cars with 70 pounds' train-pipe pressure; brakes will be applied by admitting, as nearly as may be, 15 pounds into the cylinder of the first car. Record of pressure in the auxiliary reservoirs and cylinders will be taken as follows: (1) At the first application. (2) In five minutes from first application. (3) In ten minutes from first application. (4) In fifteen minutes from first application. (*b*) Quick-action application.—This will be the same as above, except that all the air will be exhausted from the train pipe. (*c*) Dummy cylinder test.—A modification of the holding test, as with the graduating test by the introduction of dummy cylinders.

No. 8.—*Release Test.*—The following conditions should be observed in this test; (*a*) Main air reservoir cut in. (*b*) Any pump or boiler pressure may be used that will maintain a uniform head of 90 pounds pressure. A uniform pressure of 70 pounds having been secured in the train pipe, all the air will be exhausted by a quick action application. A pressure of 90 pounds will then be maintained against a diaphragm perforated by a 3-32 hole, and a record taken of all brakes that release inside 30 minutes. In making this test special care must be taken to see that there is no leak in the train pipe. It will not be considered satisfactory if a greater proportion than 10 per cent. fail to release in the prescribed time.

(This test, in addition to testing the release features of the triples, is intended as an equivalent to a release after a break-in-two in train service.)

No. 9.—*Test to Determine the Time of Charging One Auxiliary Reservoir.*—Cut out the brake to be tested by the cut-out cock. Bleed the auxiliary reservoir empty and close the bleed cock. Keep the pump running and maintain a head of 90 pounds in main air reservoir and train pipe during test. Cut in the brake to be tested and note from the reading of the gage the time occupied in charging to 70 pounds. The time of charging should be 55 seconds. The reservoir should not be charged in less than 45 seconds or more than 60 seconds.

(The object of this test is to prevent irregular charging of auxiliary reservoirs, and thus insure that the front brakes will not apply after charging.)

No. 10.—*Test to Determine Whether Quick Action Will Follow a Service Application.*—Commencing with a service application of 20 pounds pressure in the first cylinder, a full quick-action reduction will follow. It will be observed whether quick action takes place or not. The pressure in the first cylinder will be increased or decreased by steps of about 5 pounds until the point at which quick action ceases or commences is determined. Quick action should take place with not less than 20 pounds in the first cylinder.

(The object of this test is to determine whether, after a service application quick action can be obtained without first releasing the brakes.)

Such additional tests as in the judgment of the committee the construction of the triples submitted to them for test warrants.

TRAIN TESTS.

In order to provide against defects which a rack test may not develop, it is recommended that railroads make a 50-car train test in actual service before accepting the result from the rack test as final. In making application test No 2 with a train, the measurement of time from the first car to the fiftieth car should be provided for. This will determine the time occupied by the engine-brake and against the car-brake. Special care should be taken with the engine and tank-brakes in order that they may do their share of the braking during the stops, and not pull away from the train. All brake-shoes must have a proper bearing on wheels, which is best accomplished by giving them some previous service before testing, and all should be of the same material. Tests to determine the shock should be made on a level track, with all the slack in the train pulled out at the time the brakes are applied.

GODFREY W. RHODES, GEORGE GIBBS, E. A. WILLIAMS, S. P. BUSH, A. S. VOGT.

From a Norwegian Standpoint.

Mr. C. L. Anderson, Auditor-General of the State Railroads of Norway, has been spending some weeks in the United States studying American railroad conditions. Speaking of the relative conditions of American and Norwegian railroads, he said :

"The Norwegian Government controls all the railway lines in Norway, and the system is a success. There are some thousand miles of railroads, with eleven divisions, but as several systems often use the same roadbed we have more miles of road in the aggregate than that figure might indicate. The longest run that can be made is about 600 miles. There are three classes of passenger accommodations, with a maximum rate a mile of what would equal 2½ cents. Freight tariffs are in twelve classes. We have adopted coaches like those in America, except that they are shorter. On the whole, it is much pleasanter to travel in America than in Norway.

"As to the question of the benefits of governmental control of roads and its feasibility in this country, I cannot say much that is definite. Considering the systems of Norway and America as they are, it seems to me that here the roads are managed more as a man would manage his private business, for his own best interest and that of the public, which is the same thing with a railroad. I regard the fixing of the tariffs by the government as a public benefit. It makes them uniform and stable—not subject to the cuts which are so common in this country. I have a great doubt if cut rates really aid business and traffic and do not disturb them. The more stable system, on the other hand, has its disadvantages. It is hard for the railroads in Norway to satisfy the people in their demands for changes when conditions vary and make change necessary. There can be no change in rates there unless the matter is submitted to the department, and it usually takes three months before anything is accomplished. The railway industry of the United States is so stupendous that there might be some question about the advisability of governmental control. The people might not get such quick and good service with the red tape of government to be gone through with.

"Competition has made the great railroads of this country. The fine accommodations are the result of competition. And now I think the railroads are being brought by their competition to a uniformity in rates and service, a sort of defense against themselves which will do much good. Still, if the government of the United States could manage the railroads without a loss to itself, I think it ought to obtain the control. The roads in Norway pay dividends as high as seven per cent. in some branches, and I think, altogether, there is a profit."

General Martinez Campos, the Spanish general sent to subdue the revolution in Cuba, evidently thinks that idleness among the native workmen is one of the things to contend with. He has offered to the American Railroad Company a monthly payment of $20,000 in consideration of the company's employing the idle natives along the route in the work of extending the tracks. He has also advocated an extensive improvement of the harbors as a means of giving work to the unemployed.

A Good Book for Travelers.

The passenger department of the New York Central has issued a handsome book of 64 pages, printed in colors, and describing a series of tours occupying from two to fifteen days, arranged for the purpose of meeting the wishes of all classes of travelers, including trips to the Thousand Islands, Montreal, Saratoga, Lake George, the Catskill Mountains, Niagara Falls, Chautauqua, Adirondack Mountains, Berkshire Hills, Richfield Springs and many other famous resorts. Information concerning these trips is given—distances, time, fares, connections and all other details—with much precision. It contains ten maps engraved expressly for this work, and is profusely illustrated with a large number of new and beautiful half-tone engravings. It can be obtained by addressing Mr. George H. Daniels, General Passenger Agent, New York Central & Hudson River Railroad, Grand Central station. New York, and sending two 2-cent stamps.

A Street-Car Quiver.

"How do you think I came to wear spectacles?" he asked. "Odd, and yet it isn't. Hundreds of persons get them the same way, through riding on street cars. No, nothing funny about it. Watch that fellow's eyes across on the other seat. He sits in the car and his eye catches sight of something on the sidewalk. He watches it an instant, and his eyes turn back as the cars go forward. He notices another, and the thing is done over again. He sees something on the walk or in the stores all the way down, and he keeps his eyes wavering back and forth. Try that for a while when you are not in a street car, and see how tired you make the muscles of your eye in a few minutes. It grows into a terrible strain, and the muscular tissue is almost paralyzed. I've been doing that for ten years. Say I do it 300 days in the year. That makes 240,000 miles my eyes have been going through that see-sawing, and it gave me the street-car quiver."

"That sour old fellow, Grumpus, has a job that just suits him." "What's that?" "He's station master where 50 trains go out every day, and he sees somebody miss every one of them."

"Is this the way to Wareham?" asked a Massachusetts girl on her bicycle of a wayside farmer, adopting the local pronunciation of the town's name. "Dumbed if I know," was his reply; "I never wore anything like them things."

"I feed you, didn't I," said the guest, who had waited long and patiently for his dinner. "Yessah." "Well, you feed me. What I want is a little reciprocity." The waiter looked at him and then murmured: "I'se sorry, boss, but I'se afraid we's jes' out ob dat."

The little girls of Boston are reported to be over-educated. The story goes that a child was asked in a street car her age, with a view to "half-fare for children." Whereupon the premature little damsel murmured, "If you don't object, conductor, I'll prefer to pay full fare and keep my own statistics."

A Boston paper tells of a house painter who sat on a ladder abreast of the third story of a brick house and plied the brush with majestic strokes, keeping time to the music of "My Country, 'Tis of Thee." A squat little German, dressed in overalls, came along. He took in the situation at a glance, The slow and graceful motions of his journeyman did not appeal to his sordid soul, for he shouted: "Say, Charley, I don'd make me no kigk on dot vistling ven you are vorking, but, Gott in Himmel, sdrike up a livelier tune."

"Defuelization" is a new word added to the language, told in a story by Senator Palmer about an Illinois farmer who for several years had been selling him wood for $6 a cord. "This year," says Senator Palmer, "he came to me with a load and I told him that I did not want it. He offered it at $2 a cord. I still refused, and he wanted to know why I would not take it at $2. I told him I was using soft coal, for which I paid $1.37 a ton. "Gosh!" he exclaimed, "I heard you was trying to demonetize silver, but now you're trying to defuelize wood."

The Detroit Steel & Spring Company is erecting a new all steel addition to its spring department, 75 feet by 100 feet; installing two new 150 horse-power boilers under which (as well as under the old boilers) it is placing the Stoker manufactured by the American Stoker Company, of Dayton, O., and is putting in coal conveyors. This company has also ordered a new 18-inch mill from the Totten & Hogg Iron & Steel Foundry Company, and a Corliss engine from the E. P. Allis Company to run the same. It is also adding a new 12-inch mill to its spring department. These additions to the plant were found necessary, as the company's business has increased nearly 100 per cent.

"I've caught you at last!" cried the enraged farmer, as he stumbled over the old darky who was enjoying himself in the green middle of the watermelon patch; "I've caught you at last—you old thief, you!" "Boss," said the culprit, as he gulped down the red heart of a fat Kolb Gem, "Boss, 'fo' de Lawd hit wuz all a axcerdent how I come heah. I wuz walking' 'long de railroad des ez hones' ez could be, when 'long come a freight train, en 'fo' I could cl'ar de track de engine hit me en th'owed me clean over de fence whar I is now, en when I fell I landed ker-blamm! on dese heah melons, en busted 'em all ter pieces; en when I come to I wuz so hungry dat I des pitch in en eat up what I done busted!"

Dixon's Graphite Pipe-Joint Compound.

Twelve or fifteen years ago this article was known under the name of "Smear Grease," and later was changed to "Pipe-Joint Grease." It really is not a grease, and as the name has caused some misunderstanding, the Dixon Company has decided to change it, and it hereafter will be known as "Dixon's Graphite Pipe-Joint Compound." This compound, under one or the other of its several names, has been in the market for about twenty years. It is not only useful for joints and all steam, gas and water piping, but is equally useful for smearing gaskets and flange-joints of meters, traps, and for bolts, screws, etc. It is superior, both in usefulness and economy, to red lead, and the Dixon Company recommends it as such with the fullest degree of certainty. That the company is not prejudiced in its favor is easily shown by the testimonials of its customers, among whom are manufacturers of steam and hot air radiators and heating appliances, iron companies, machinists, engineers and contractors, railroad companies, gas companies and general manufacturers. The President of the Water and Lighting Department of Harrisburg, Pa., said:

"I have long ago forbidden the use of white or red lead, or anything but your Graphite Compound, in this department. The result is that we have no more breaking of bolts or nuts on our street mains, valves, etc., or any trouble of that kind in or about our pumping plant. I think those plumbers or steam-fitters who persist in the use of white or red lead are doing so purely through ignorance, as nothing is so costly, not even carelessness."

This graphite pipe-joint compound is manufactured by the Joseph Dixon Crucible Company, of Jersey City, N. J.

Car Buyer's Helper.

The above is the name of a book of 172 elegantly printed and illustrated pages, bound in cloth in the best style of the binder's art. It is published by the Brownell Car Company, of St. Louis, and its purpose is to give those who buy cars sufficient knowledge of electric and cable cars to enable them to negotiate for the same advantageously. This purpose is carried out in a most admirable, intelligent and practical manner. The 172 pages of the book are devoted to explaining, in clear and simple language, the construction of street cars, and explaining how the details of construction can be slighted in material and workmanship to the great advantage of the builder and the disadvantage of the buyer and owner. Where illustrations are needed to make a point clear these are given in the highest state of the engraver's art, making the lessons they teach impressive.

To our view the book is particularly opportune at this time, when there is a national movement on foot to substitute larger and stronger street cars in place of the old horse cars. Electric and cable traction require stronger construction to withstand the increased severities of the faster speeds and the quicker starts and stops. Considered from either the standpoint of a wise purchaser or of an honest builder, this book is one of the most useful helps that we have seen in a long while. As a sagacious business move, its publication is exceedingly admirable, and as an instructive guide to car purchasers it is equally so.

The Dummy of the Lakes.

Those who visited the World's Fair and inspected the brick battleship on exhibition will read with interest this ironical poem about it in the Chicago *Tribune*:

THE OLD BATTLESHIP ILLINOIS.

Ay, tear her lath and plaster loose,
Rip off her plates of tin,
Knock in her brick and mortar hull
And let the daylight in!

No more with stern and warlike mien
Shall Neptune's gallant sons
Her grim sheet-iron turrets guard
Or clean her wooden guns.

Marines no more shall smear her decks
With ginger beer and cakes,
The lubbers of the shore shall loot
The dummy of the lakes.

Oh, better that her battered hulk
Be dumped in some deep spot,
Than that she stand there on her piles
And rot, and rot, and rot!

Turn loose the wreckers on the wreck,
Break up the rank old ark,
And let the painted fraud no more
Disfigure Jackson Park.

The New York *Tribune* in discussing editorilly the need of of a uniform system of placing signs on street corners in the city telling the names of the streets, recommends the enameled iron signs used to disylay the names of stations on the Manhattan and some other roads and described in our May issue. These signs are made by Mr. F. E. Marsland, of 84 West Broadway, New York.

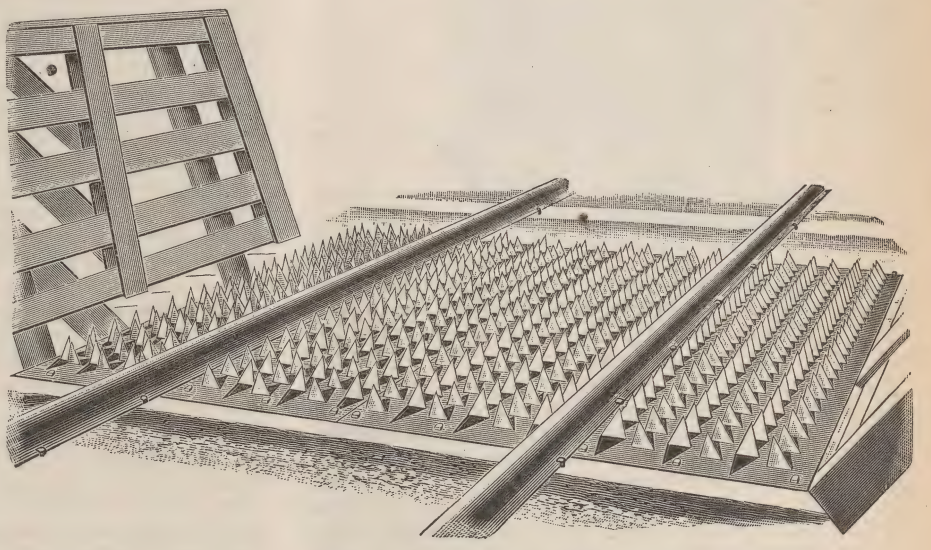
"Give me a ticket to Helephant?" said a florid English gentlemen to one of the busy ticket clerks at the Union Station, St. Louis. The clerk looked puzzled for a moment, and then said, "Are you sure you want to go to Helephant? I don't know of any such place on our line." "Awe, man, dost thou think I'm a bloomin' fool. I want to go to Hontaria, and they sed I must go to Helephant and Niagry Falls." "We could send you by way of Buffalo," said the impatient clerk. "Awe, blast me eyes, Buffalo! That's the cussed place. I knew it was some kind of a blarsted hanimal. Give me a ticket to Buffalo, not to Helephant."

The Sheffield Car Company, of Three Rivers, Mich., has issued a special foreign edition of the catelogue of its articles of manufacture. This is in English, French, German and Spanish. The light cars made by this company are sent to nearly every part of the world, and in consequence a catalogue printed in these widely spoken languages has become a necessity.

An Improved Form of Cattle Guard.

It has always been the custom of railroads to build pits at the points where wagon roads cross their right of way to keep cattle from straying thereon. These, however, were expensive to keep up owing to decay of timbers and difficulty in keeping the track from settling at such points. They also proved very annoying whenever a derailment occurred near one of them, as if the train was going at speed an expensive wreck was almost sure to occur. There being two of these pits, one on each side of the road-crossing, in nearly every mile of track on American roads, it is easy to see that some desirable substitute has long been looked for. Within the last few years various appliances have been introduced in the nature of different arrangements of bars or rods of steel, which could be laid directly upon the ground, and from the construction were more or less difficult for cattle to cross. Many of these devices have been objectionable from lack of durability on account of the action of the elements, and they also frequently make a disagreeable rattling noise when trains are passing over them at speed.

We illustrate above a new candidate for this line of work, in the "Sheffield Guard," which certainly seems to be a device that would effectually prevent all kinds of stock from crossing, and be, therefore, the article which railroad men have been looking for for a long time. It consists of four interchangeable plates of steel boiler plate in which sharp teeth are struck up very close together all over the surface, presenting a seemingly impossible barrier to straying stock of all kinds.



IMPROVED CATTLE GUARD.

The points are a little less than three inches apart in each direction, from which it will be seen that it is almost an ideal guard, it being apparently impossible for any animal to step upon it without coming in contact with one or more of the points, which, of course, are painful, and the animal turns back rather than venture further against the long array of formidable teeth. Another strong merit is its simplicity, as there are no rods or bars to become broken or displaced and no previous preparation of the track whatever is needed for it to be put in place. It is also not liable to the objection raised against other guards of lack of durability, and the weight of the material precludes its being noisy by reason of passing trains. This guard is usually covered with a heavy coat of asphaltum, or, at an additional charge, the sheets are furnished galvanized. It is made by the Sheffield Car Company, of Three Rivers, Mich., and has already been adopted as a standard cattle guard by a number of the leading roads.

Improvement in Sanding Apparatus.

An improvement has been made in Leach's pneumatic track-sanding apparatus. It has been found that the feed valve was occasionally left open longer than necessary by the forgetfulness of the engineer, his attention being called to other duties while the device was in operation, and waste of air and sand and unnecessary wear of tires has been the result. To avoid this difficulty a tell-tale valve is arranged in the wheel, which sounds a warning whenever the valve is opened for sanding, unless prevented by the pressure of the engineer's hand. If the hand is removed for other duties, the warning sounds until the hand is replaced or the valve closed.

This apparatus is manufactured by Mr. Henry L. Leach, of 70 Kilby street, Boston, Mass., and is being rapidly introduced on numerous railroads.

The Pullman Company is building 20 handsome coaches for the Southern Railway, as well as another lot for the Boston & Albany, and we learn that the elegant "Walkover" seats, which attracted so much attention at the recent Thousand Islands conventions, have been ordered for all this equipment. Messrs. Hale & Kilburn, the invenors, report that it has also been ordered by the Plant System, the Big Four, Cleveland, Lorain & Wheeling, etc., and that they have other orders in hand for this seat for about 25 cars.

The Newton Machine Tool Works, of Twenty-fourth and Wood streets, Philadelphia, have increased the pay of all the men employed therein 10 per cent.

Messrs. Bement, Miles & Co., of Philadelphia, manufacturers of metal-working machine tools for railroad and machine shops, have opened an office in Chicago. Mr. Charles E. Billin will represent the company there, and have his office at 1534 Marquette Building.

The Charles Scott Spring Company, of Philadelphia, has issued a new catalogue of springs made by it for use on street railways. The catalogue itself is very nicely printed and illustrated on good paper, and is bound in black leatherette, having gilt letters. A variety of elliptic and helical springs are illustrated in the catalogue, together with other forms of springs used in electric street railway service. One form of elliptic spring has auxiliary leaves which are separated when the spring is free or but slightly compressed (as is the case when car is but lightly loaded). When the heavier load is applied, or an unusual jar or jolt takes place, they are brought together at the ends and add to the capacity of the spring, and relieve the strain on the other leaves. It is obvious that such a spring is truly graduated for different loads.

Second-Hand Cars.

The Fitchburg Railroad Company has 20 second-hand passenger cars, which the Purchasing Agent, Mr. George J. Fisher, of Buffalo, is instructed to sell. The following description of one of these cars shows the character and average condition of most of them:

Kind of car, passenger; gage, 4 feet 8½ inches; No. 23; length over body, 52 feet 3 inches; width over body, 9 feet 4 inches; height at side, 6 feet 7 inches; edge skylights, 6 feet 11 inches; center, 8 feet 6 inches; kind of roof, Monitor; headlining, canvas; how ventilated, hinged sash; number windows, side, 18; size of glass, 16 by 22 inches; blinds or curtains, blinds; inside finish, ash; kind of platform, Miller; coupler, Miller; body color and striping, Pullman and gold.

Interior.—Kind of seat frames, wood; upholstering, plush; how lighted, 3 double lamps; how heated, steam, 1 stove; parcel racks, 16 wire; closets, 1; water cooler, none.

Trucks.—Equalized; diameter wheels, 33 inches; body springs, elliptic; eq. springs, spiral; diameter journals, 3¾ inches; length journals, 7 inches; brakes, Westinghouse; height top of rail to top floor, 4 feet 2 inches.

General condition, good; trucks, good; outside, good; inside, fair; plush, fair; head lining, fair; journals, good.

The Fire Commissioners of New York City have adopted the ball nozzle as an additional equipment of the department. This nozzle was illustrated in our last issue, and is made by the American Ball Nozzle Company, of New York. The Chief of the New York Fire Department has reported that the Clarendon Hall was saved from destruction by the timely use of the ball nozzle. The fire in this case was in the air chamber; firemen tried to enter through the trap-door with a straight stream of water, but the flames were so fierce that entrance was out of the question, when the ball nozzle was brought into play and a single hoseman using the ball nozzle spray made instant entrance and in a few moments conquered a fire that would otherwise have proved very disastrous.

Some Useful Literature for Travelers.

The Atchison, Topeka & Santa Fe Railway has issued through its passenger department some very interesting and nicely illustrated and printed books, descriptive of the territory through which its lines pass. These extend unbroken through Illinois, Iowa, Missouri, Kansas, Colorado, New Mexico, Arizona and California to the Pacific Coast. The first of the books mentioned is devoted to describing and illustrating the beautiful scenery of Colorado; the delights of its climate and its unsurpassed hunting and fishing grounds. The second book, entitled "To California and Back," describes a trip from Chicago to California and return, and gives in an interesting way a great deal of information concerning the history and natural resources of the localities passed through on the journey. The third book, entitled "Southern California," gives a general description of this beautiful and bountiful country, and many illustrations of its delightful scenery.

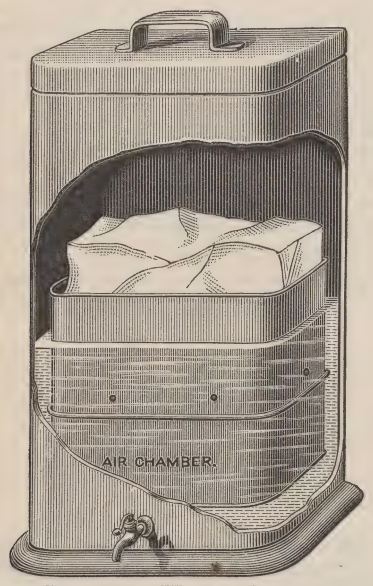
In the Adirondacks.

Persons comtemplating a visit to the Adirondack Mountains should get a copy of the little book, just issued by the New York Central, bearing the title "In the Adirondacks." It will not take long to read, for it contains only sixty-four pages, but every page bristles with information of just the practical kind one wants at such a time. From this book in half an hour one can secure a good general idea of the Adirondack region—its grand divisions, characteristics of each, the location of the principal resorts, and how to reach them. Not the least valuable feature is a fine new relief map, printed in four colors, showing the correct location of all the principal mountains, lakes and streams; also all stage lines, wagon roads and carries, and on the back a complete list of hotels, cottages and camps—location, dates of opening and closing, rates, etc.

At the annual election of the New York Air-Brake Company, held June 21, the following officers were elected: Mr. Charles A. Starbuck, President; Hon. D. Magone, Vice-President; Mr. John C. Thompson, Secretary and Treasurer. This company has received orders from the M. K. & T. for 2,000 sets of freight car brakes for the new cars now being built by the Madison Car Company and the Missouri Car & Foundry Company.

Improved Water Coolers.

An important requisite for the comfort of railway passengers is a supply of good drinking water. Indeed, it is also an important requisite in shops and offices, and all places where people remain for any considerable length of time. For comfort the water must be cool, and for health it should be as pure as possible. One thing that detracts from the purity of ice water as generally used is the fact that all the impurities in the ice are imparted to the water. These are considerable in amount and various in kind. In the formation of "natural" ice all substances that by their specific gravity float on the surface of the water are incorporated in the crystallization and held until released by the melting of the ice. These impurities are various in kind, as stated, and



Improved Water Cooler.

consist generally of vegetable matter, such as sticks, grass, etc., and frequently animal matter in a state of decomposition. These sometimes contain the microbes of disease that may be killed by heat, but not by cold.

The improved water cooler illustrated herewith is designed to prevent the contamination of drinking water by these impurities; to impart to the water a pleasant, refreshing coolness similar to that of spring water (from 44 to 48 degrees), and yet prevent its becoming excessively cold. These objects are accomplished by a float that holds the ice separate from and above the water. It also effects a material saving of ice. These coolers are made by Mr. A. Major, of 461 Pearl street, New York. They are made of glass, and the floats, mentioned and shown in the cut, are made of either copper, nickel-plated or galvanized iron. They are beginning to be widely adopted, and the form shown in the cut is being used, we are informed, on the New York Central.

Health and Pleasure.

The above is the title of a nicely printed and illustrated book recently issued by the passenger department of the New York Central Railroad. Besides giving photographic illustrations of numerous health and pleasure resorts along the Hudson River, and in the Catskill and Adirondack Mountains, it gives also some valuable information about the hotels and boarding houses in the different vicinities, including their capacity, rates, distance from depots, etc. The book also contains tables showing the relative distances between principal American and European cities, and the time required to traverse the same. The price of the book is 25 cents.

The Cincinnati, Hamilton & Dayton; Cincinnati, Dayton & Ironton and Cincinnati, Dayton & Michigan railroad companies were consolidated by an agreement filed with the Secretary of State of Ohio, July 12. The company is to be known as the Cincinnati, Hamilton & Dayton Railway Company.

A large crowd of tramps captured a freight train on the Philadelphia, Wilmington & Baltimore Railroad July 10, after firing a fusilade of pistol shots at the enginemen and train crew. Assistance was dispatched to the scene from Canton, Md., and 16 of the tramps were arrested and afterward given the comparatively light punishment of 10 days in jail.

Mr. James McNaught, of the Northern Pacific Railroad, who has just returned from a trip through the Northwest, finds that the mineral and agricultural productions of this year promise to exceed in value those of any recent year. The earnings of the Northern Pacific road for the last fiscal year, he says, were 20 per cent. better than they were for the fiscal year ending June 30, 1894; and for the fiscal year ending June 30, 1896, will be 20 per cent. better than the last year.

An Illinois Central passenger train was wrecked at a switch, three miles from Ponchatoula, La., on the night of July 12. The switch had been opened and the train struck a train of empty coal cars standing on the siding, overturning the engine and baggage car. The remainder of the train kept the rails and none of the passengers were hurt. The engineer was instantly killed and the fireman had both arms broken and was seriously bruised about the body. Five negroes were afterward arrested, charged with breaking the lock and opening the switch.

A trolley car in charge of an inexperienced motorman ran away at East Liverpool, O., July 8. Attaining a high speed at the foot of a hill it jumped the track on a sharp curve, and went over a twenty-foot embankment into a creek. The momentum was so great that half the car was almost buried in the sand. The motorman was instantly killed. The car broke in two as it struck, and several passengers fell through the floor, and were plunged headlong into the creek. Eleven passengers were seriously injured, of whom six were women.

Steam and Air-Brake Hose.

An item of considerable expense in the operation of air-brake and steam heated equipment on railroads is the cost of hose used. The conditions of service are less severe with air-brake hose than with steam hose, principally because of the absence of the wide extremes of temperature to which the steam hose is frequently subjected. Air-brake hose generally lasts from six to eighteen months in freight service, and from one to four years in passenger service. Steam hose in train service lasts from thirty days to two months when transmitting steam of about one hundred pounds pressure for electric light purposes; when used only for steam heating, with twenty to fifty pounds pressure, it lasts from three months to three seasons. This extremely wide variation in the length of life in hose for the purposes named is due almost entirely to the quality of hose used, and those who have given the matter special attention have found that the very best quality of nose in the market is very much the cheapest. Aside from the methods of manufacture, the criterion of excellence in hose is the amount of rubber employed. Rubber is easily adulterated, as in its green state it is capable of absorbing as much as 80 per cent. of cheap minerals when being ground and compounded, but in this condition is useless for mechanical service. The better grades of rubber contain only from 20 to 40 per cent. of minerals. This explains the difference in the prices of some rubber goods. The cheaper a buyer demands these, the less rubber he naturally gets.

A mistake frequently made by those buying hose is in judging of its excellence by what is known as its hydraulic strength, or its ability to withstand hydraulic pressure of from 500 to 1,000 lbs. per square inch. What gives hose the strength to withstand such pressures is the duck employed in its manufacture—and not the rubber used. Beyond a certain point this quality is not important, because an exceedingly strong hose may be made by using heavier duck, and yet a poor quality of rubber. Such hose can have but a very short life in use. The better the quality of rubber used in the tube and coating the greater will be the elastic strength and endurance. The cheaper grade of hose grows hard and will crack in a very short time, while the better gum or rubber will wear for years without getting hard.

The illustrations on the following pages show some remarkably good hose, and the records of the performance of some of these emphasize what is said in the foregoing. The hose illustrated was made by the Peerless Rubber Manufacturing Co., of No. 16 Warren street, New York, and the long service of the specimens shown attest the excellence of their quality.

The rubber employed in Figs. 1, 2 and 3 is the finest material produced and is very lightly compounded. That there is skill employed in putting this hose together successfully to conduct high pressure steam is a fact evident to all rubber manufacturers as well as to expert buyers.

The two pieces of hose in Figs. 1 and 3, also in Fig. 5, show phenomenal service. While the hose in Fig. 5 shows three years' service in conducting from 35 to 65 pounds steam, and though still in fairly good condition, it plainly shows that disintegration has commenced. In other words, the rubber has become so thoroughly cooked from time to time that its life and substance have practically been dried out, and, of course, it will be better not to run it any longer, as any further disintregration will have a tendency to allow particles to break off and possibly stop up the strainers or valves.

The use of wire in wrapping hose is to be deplored, particularly if steam is employed, because the hose when conducting steam softens at lease 25 per cent., and heat also has a tendency to expand the hose. It is a well known fact that steam heating apparatus requires an exact length of hose on many roads, and the complaint is frequently made that the hose *grows* too short. This is owing to the expansion of the of the hose. Many of the manufacturers and railroad companies have decided to overcome this expansion by wrapping hose with wire. The result is that while the hose does not expand outwardly and contract in length, it must move somewhere, so it goes in the only direction which is left. In other words, it swells the inside of the tube, eventually choking up the inside diameter of the hose completely. See Fig. 10 in the following illustration. The wire also under steam pressure becomes as hot as the steam, and in cooling takes longer to cool than the hose. This tends to burn and chafe the hose. Wire is also detrimental to the hose in other ways.

Fig. 13 shows the inside diameter of an air-brake hose in use over three years. This hose is made of the best material all the way through, tube, coat, friction and jacket. Barring accidents there is no question but what hose made of such material will wear from three to five years in passenger service, and probably about two-thirds that time in freight service.

Fig. 15 shows the injurious effects on hose caused by burs on the shanks of couplings. A small bur will cut the tube of the hose very rapidly, and when the tube of any hose is once punctured its usefulness is gone.

The Niles Tool Works of Hamilton, O., are furnishing some machinery for the shops of the Baltimore & Ohio Southwestern Railroad at Washington, Ind.

The Magnolia Metal Company reports that its sales for 1894 were more by one third than in any year since it has been in business, also that its sales for June were more than for any one month during the past two years.

What promises to become a very widely-used device, is the "Standard" automatic brake-slack adjuster, a model of which was exhibited at the mechanical conventions by Mr. J. H. Sewall, of 100 Exchange street, Worcester, Mass.

The property of the Johnson Railroad Signal Company, of Rahway, N. J., including real estate, buildings, machinery, materials, patents and good-will has been sold by the Chancellor of New Jersey to the National Switch and Signal Company, of Easton, Pa.

To master mechanics interested in fuel economy, the exhibit of "Magnesia" sectional lagging for locomotives was one of the most suggestive exhibits observed at the Alexandria Bay convention. This excellent covering is made by Keasbey & Mattison Company, of Ambler, Pa.

The "Champion" Steam Joint Grinder, exhibited at Alexandria Bay by Mr. Frederick Brandes, of Rondout, N. Y., attracted a good deal of notice and prompted much favorable comment. It is a machine for grinding steam-pipe joints, and especially adapted for locomotive work.

The Norton improved ball-bearing ratchet screw jacks attracted considerable attention at the Master Car Builders' and Master Mechanics' Conventions. These are made by Mr. A. O. Norton, of 97 Oliver street, Boston, Mass. They are adapted to all branches of railway service, from track to shops, and for carrying on locomotives and tool cars.

The Vessot oiler exhibited at the conventions is a device for securing more perfect car journal lubrication. This is obtained by a simple arrangement that excludes dust and keeps the journal bathed in oil, resulting in increased life of bearing and reduced friction and necessary expenditure of motive power, economy of oil, and cleanliness. It is made by S. Vessot & Co., Joliette, Que.

One of the most notable safety devices exhibited at the Master Mechanics' Convention was the Foster improved safety boiler check. The safety of the traveling public requires (even more than that of enginemen) that the element of danger latent in projecting boiler checks shall be eliminated from locomotives. These improved checks are located inside the boiler, and in case of accident absolutely prevent the escape of steam or water. They are made by the Foster Engineering Company, of 21 and 23 Prospect street, Newark, N. J.

Most of those who attended the mechanical conventions in June will remember the display of the brilliant illuminant, Acetylene gas, in the evenings. This gas is manufactured by the Acetylene Gas Equipment Company, of 556 West Twenty-seventh street, New York. The principal advantages claimed for this gas is that being in a liquid state under pressure it occupies but .04 of the volume of ordinary gas, the tanks required therefore being proportionately smaller and more easily handled. It has greater illuminating power than ordinary gas, deposits no tar in burning, and is not effected by temperature.

One of the most interesting exhibits at the Alexandria Bay conventions in June was that of the Crosby Steam Gage and Valve Company's standard locomotive specialties. These consisted of improved pop safety valves, indicators, speed counters, blow-off valves, steam and duplex gages, and single bell chime whistles. We wish to speak particularly of the whistles on this occasion. Railroads careful of the comfort of their patrons are beginning to give the harsh-toned whistle nuisance deserved attention. The peculiar merit of the Crosby whistle consists in producing three distinct tones pitched to the first, third and fifth of the common musical scale, which harmonize and give an agreeable musical chord. It is more penetrating than the common whistle, and can be heard at a greater distance. It effectually obviates the harsh, disagreeable noise which has been a source of common complaint in other whistles. This whistle is used extensively on locomotives, and is warmly endorsed by railroad men and by the traveling public wherever used. They overcome one of the chief annoyances of railway travel and serve to distinguish passenger from freight trains.

Our Directory

OF OFFICIAL CHANGES IN JULY.

We note the following changes of officers since our last issue. Information relative to such changes is solicited.

Atlantic & Danville.—C. D. Owens is elected Vice-President and General Manager. Office, Norfolk, Va.

Baltimore & Lehigh.—Master Mechanic W. L. Guyton is succeeded by F. H. McGee.

Centralia & Chester.—Geo. W. Bartlett is appointed General Manager.

Cincinnati, Saginaw & Mackinaw.—Superintendent R. W. Cummins died June 22.

Colorado Midland.—George W. Ristine is appointed Receiver.

Columbus, Sandusky & Hocking.—J. H. Stewart is appointed Receiver. Wm. Thornburg is appointed General Manager. Purchasing Agent J. C. Hoover has resigned.

Evansville & Richmond.—H. C. Barlow is appointed Receiver.

Gulf, Beaumont & Kansas City.—James Smith is appointed Master Mechanic, with office at Beaumont, Tex.

Humstone & Shenandoah.—E. C. Murphy is appointed Receiver, with office at Clarenda, Ia.

International Great Northern.—E. E. Calvin is appointed General Superintendent, with office at Palestine, Tex.

Jamestown & Lake Erie.—E. T. Haines is elected Vice-President and General Manager; office at Jamestown, N. Y.

Kansas City, Fort Scott & Memphis.—General Superintendent W. W. Fagan has resigned, and is succeeded by J. H. Emmert. R. R. Hammond is appointed Division Superintendent at Springfield, Mo.

Litchfield, Carrollton & Western.—W. E. Roberts is appointed Master Mechanic, vice W. Lipscomb, resigned.

Manhattan.—Master Mechanic T. W. Peeples has resigned, and is succeeded by M. McNally.

Middle Georgia & Atlantic.—Joseph W. Preston is appointed General Manager, with office at Atlanta, Ga.

Minneapolis, St. Paul & Sault Ste. Marie.—Purchasing Agent T. A. Switz is appointed Assistant to the General Manager.

Mobile & Birmingham.—T. G. Bush is elected President and General Manager.

New Orleans & Southern.—General Manager G. S. Taylor is appointed Receiver.

Ohio River.—Master Mechanic J. B. Dorsey has resigned.

Panama.—George Whaley is appointed Vice-President and General Manager.

Port Jervis, Monticello & New York.—S. D. Lake is appointed General Superintendent.

Southern Pacific.—General Manager A. N. Towne died July 16th.

St. Louis & San Francisco.—L. B. Button is appointed Superintendent at Springfield, Mo., Vice W. A. Thomas, deceased. A. O'Hara is appointed Superintendent at Neodosha, Mo.

Ulster & Delaware.—General Superintendent J. H. Jones has resigned.

Union Pacific, Denver & Gulf.—J. A. Rasbach, Superintendent at Cheyenne, has resigned.

Union Pacific.—Superintendent, Idaho Division, E. E. Calvin has resigned, and is succeeded by H. E. Van Hoover.

Zanesville & Cincinnati.—James K. Geddes is appointed Receiver.

NATIONAL CAR AND LOCOMOTIVE BUILDER

SEPTEMBER, 1895.

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The Mobile & Birmingham recently ordered 100 box, 100 flat and 8 stock cars.

The Chicago, Burlington & Quincy has invited bids for 5,000 M. C. B. couplers.

The Toledo & Ohio Central has ordered two parlor cars of the Pullman Company.

The Mexican Central has ordered five locomotives of the Brooks Locomotive Works.

The Altoona shops of the Pennsylvania Railroad are now building 750 new freight cars.

The Calumet & Blue Island has ordered 200 box cars of the United States Car Company.

It is stated that the Toledo & Ohio Central will soon be in the market for 100 or 200 coal cars.

The Philadelphia & Reading has ordered 1,000 eight-wheel coal cars of the Pullman Company.

The receivers of the Memphis & Charleston Railway have been authorized by court to buy 200 box cars.

The Houston & Texas Central has ordered nine locomotives of the Schenectady Locomotive Works.

The Cleveland, Lorain & Wheeling has ordered six locomotives of the Brooks Locomotive Works.

It is officially stated that the Canadian Pacific will purchase a large number of freight cars this fall.

The Florida Central & Peninsular has ordered three locomotives of the Rogers Locomotive Company.

A double track electric railway is about to be built in Japan between Tokio and Yokohama, 18 miles.

The Pittsburgh Junction Railroad has ordered two locomotives from the Pittsburgh Locomotive Works.

The Burlington, Cedar Rapids & Northern has ordered 100 furniture cars of the Wells & French Company.

The Pacific Iron and Nail Works, of Oakland, Cal., which were destroyed by fire some time ago, will be rebuilt.

The Seattle, Lake Shore & Eastern has placed an order with the Richmond Locomotive Works for one engine.

Swarms of potato pugs on the rails of the Sea Beach Railroad delayed a passenger train 30 minutes, August 17.

The H. C. Frick Coke Company has placed an order with the Michigan-Peninsular Company for 400 open coke cars.

The Brooks Locomotive Works have orders for building four locomotives for the Oregon Railway and Navigation Company.

The Brooks Locomotive Works are building 10 six-wheel connected engines for the Burlington, Cedar Rapids & Northern.

The Pennsylvania Railroad has ordered 300 box cars of the Ohio Falls Car Company, and 200 of the St. Charles Car Company.

The Jackson & Sharp Co., of Wilmington, Del., is building 10 passenger cars for the Tehuantepec National Railroad of Mexico.

Early in August the Pennsylvania Railroad placed orders for 9,000 tons of steel rails, making a total of 56,000 tons ordered this year.

The Richmond Locomotive Works has an order from the Southern railway for eight engines, and from the Augusta Southern for two.

The shops of the Pittsburgh & Lake Erie at McKee's Rocks, Pa., have recently turned out two heavy switch engines for that road.

The Brooks Locomotive Works increased the pay of its 1,200 employees 10 per cent. on Aug. 1, restoring the rate paid previous to January, 1894.

A private car for the General Manager of the International & Great Northern road is being built at the company's shops at Palestine, Tex.

The Chicago & Northwestern is reported to have placed an order with the Hashkell & Barker Company, of Michigan City, Ind., for 1,500 box cars.

The Baltimore & Ohio Southwestern has ordered five postal cars of the Barney & Smith Car Company, and 51 ballast cars of the Wells & French Company.

The Baldwin Locomotive Works have orders for three locomotives from the Guatemala Central, one from the Central of Georgia, and two from the Mobile & Birmingham.

Tulare, Cal., boasts of a woman engineer who has charge of the engine in one of the largest lumber mills near there. She is said to be fully able to repair it herself when necessary.

The Wabash Railroad Company has presented Mrs. Preston, whose son was killed in the burning of the roundhouse at Toledo last spring, with $2,000 and a life pass over its lines.

A misplaced switch turned an Alabama Midland engine and pay car on a saw mill side track at Alexanderville, Ga., August 20. Engine, mill and car were wrecked and three men injured, one fatally.

The Illinois Central is in the market for 50 locomotives, to consist of four suburban, 12 switch and 34 freight engines. The latter will be Moguls, with Belpaire boilers and 19 by 26-inch cylinders.

The largest deposits of asphaltum are found in California, Utah, Oklahoma, Texas and Montana. That from Utah is said to be the purest in the world, the total product in 1894 being valued at $353,000.

The Ramapo Iron Works, of Hillburn, N. Y., is building 10 box and 40 flat cars for the Jamaica Railway. These will be equipped with Gould couplers, Westinghouse air-brakes and National hollow brake beams.

The Baldwin Locomotive Works is building several engines for the Paulista Railroad in South America, and has small orders for the Cincinnati, New Orleans & Texas Pacific and the York Southern in Pennsylvania.

The General Electric Company, which employs between 7,000 and 8,000 men at its three establishments in Schenectady, N. Y., Lynn, Mass., and Harrison, N. J., is considering the idea of concentrating all of its interests in one place.

The Cleveland, Lorain & Wheeling has ordered 600 coal cars of the Michigan-Peninsular Car Company, and 150 of the Wells & French Company, and 150 of the Mount Vernon Car Company. These cars are to be of 60,000 lbs. capacity.

A rear end collision of freight trains at a water tank on the Lehigh Valley Railroad, near Flemington, N. J., August 18, resulted in wrecking an engine and 10 cars, and killing the conductor of the train run into, he being asleep in the caboose.

Prof. Durand, in an article in *Cassier's Magazine*, discusses ship propulsion by storage batteries, and concludes that for the same amount of energy storage batteries at present weigh about 550 times as much as coal and occupy about 220 times the space.

Fourteen men ascended to the top of a blast furnace of the Carnegie Steel Company at Braddock, Pa., August 20, and tried to remove an obstruction in the stack. While at work a great volume of gas exploded, killing eight men and seriously wounding the other six.

The Ohio Falls Car Manufacturing Company, of Jeffersonville, Ind., has received an order for 200 ventilated box cars from the Memphis & Charleston railroad. Westinghouse air brakes, Janney couplers, National hollow brake beams and Hutchins roof are specified.

Mexico knows how to treat devilish boys that wreck railroad trains. One of these imps was executed at Pachuca, Mex., Aug. 18, for his second offense of this kind. There is only one good place for successful and would-be train wreckers, big or little, white or black, and that is under the grass.

The Acting Secretary of the Navy has asked the Musicians' Union of Philadelphia if it has any objections to the presence of the United States Marine Band at the Letter Carriers' Convention to be held on September 2. If not, the band will be ordered to Philadelphia on that date. This is disgraceful.

There are now in Japan 29 railroad companies which have become working concerns. The total length of lines owned by them is 2,193 miles, of which 1,549 miles are open for traffic. The government railways actually in operation aggregate 580 miles, and those in course of construction 398 miles.

The Southern Railway vestibuled limited trains between Washington and Atlanta have heretofore been composed of only dining and sleeping cars, and the ordinary mail and baggage cars. Hereafter each of these trains will have a day car, six handsome vestibuled coaches having been recently built for this purpose.

About a year ago we told of the Chicago lunatic who thought he was the New York Central's famous locomotive 999. Now Ann Arbor, Mich., has produced another lunatic who imagines he is an express train, and spends nearly all his time in imitating the noises attendant on starting up and stopping a train.

When the Grant Locomotive Works failed a couple of years ago they had orders to build 22 locomotives for the Chicago, Burlington & Quincy Railroad. The Siemens & Halske Electric Company, which recently bought the plant of these works, is now building those engines, which will be placed on the market, and, without doubt, find ready sale early in the fall.

The Southern Central Railroad Company was reorganized August 24 under the new name of the Lehigh and New York Railroad Company. The road runs from North Fair Haven, Cayuga County, N. Y., through the counties of Cayuga, Cortland, Tompkins and Tioga, to the Pennsylvania State line, near Sayre, Penn., a distance of one hundred and fifteen miles.

The shops of the Atchison, Topeka & Santa Fe at Arkansas City, Kan., which were burned about three months ago, are to be rebuilt at once. The town has deeded 15 acres of land adjoining the company's present property for the enlarged shops. The machine shop will be 70 by 100 feet, and the new roundhouse will contain 25 stalls, the old roundhouse which was burned having only 10 stalls.

The Supreme Court of Nebraska has declared unconstitutional the law requiring railway engineers to whistle at every highway, and imposing a fine of $50 for every failure to do so, half of which went to the informer. For years the farmers along the railways have made considerable money by bringing suits under this law. It is said that the Union Pacific Railroad recently had to pay $3,500 to one man alone.

A buzzard was attracted by the headlight of a passenger engine running on the Louisville & Nashville one night recently, it is reported, and in the resulting collision the headlight exploded, covered the front of the engine with flame, scared the engineer, who made an emergency stop that shook up and scared all the passengers. After the panic the burned body of the buzzard was found wedged in the broken headlight.

The San Francisco *Chronicle* says that the Southern Pacific is equipping some of its suburban engines running out of San Francisco for burning oil, crude petroleum, which can be supplied for about 75 cents per barrel. Coal costs the company about $5 per ton. The Southern California Railroad is changing its engines so as to burn oil at the rate of about three a month, and the results so far have been quite satisfactory.

John Brown's Fort is to be taken back to Harper's Ferry from Chicago, where it was taken to be exhibited at the Columbian Exposition. As an exhibit it was not financially successful, and it has been in the Sheriff's hands. Miss Kate Field started the agitation for its return to Harper's Ferry, and public-spirited people contributed the necessary funds. The contribution of the Baltimore & Ohio railway takes the form of free transportation.

Robbers stopped the eastbound overland "Flyer" on the Union Pacific early on the morning of Aug. 21, near Gothenburg, Neb. They cut off the engine and made the engineer help break open the express car. The fireman displayed both courage and intelligence by immediately starting the engine and running to Gothenburg for assistance. The robbers were disconcerted by this and did not stay long enough to finish their job, but robbed the safe of about $130 and escaped.

Edward Wilcox, one of the oldest engineers in the service of the Michigan Central Railroad, died at Michigan City, Aug. 14, from the infirmities of age. Mr. Wilcox enjoyed the distinction of being at the throttle of the engine that pulled the funeral train that bore the body of Abraham Lincoln from the nation's capital to Chicago. He was a personal friend of Mr. Lincoln, having known him from boyhood, and for this reason was assigned the duty of guiding the funeral train on the memorable journey from Washington.

Mr. Alexander W. Smith, Chief of the Department of Public Comfort of the Cotton States and International Exposition, has arranged with the Pullman sleeping car company for 300 sleeping cars, to be parked on the railroad sidings in and about Atlanta, and has arranged with the city for the necessary sanitary service. These sleeping cars will accommodate between 7,000 and 8,000 people, and the berths will be rented for $1 per night. Mr. Smith has secured from the Southern Railway sidings enough to accommodate one-third of these cars, and expects to place the rest with the other roads.

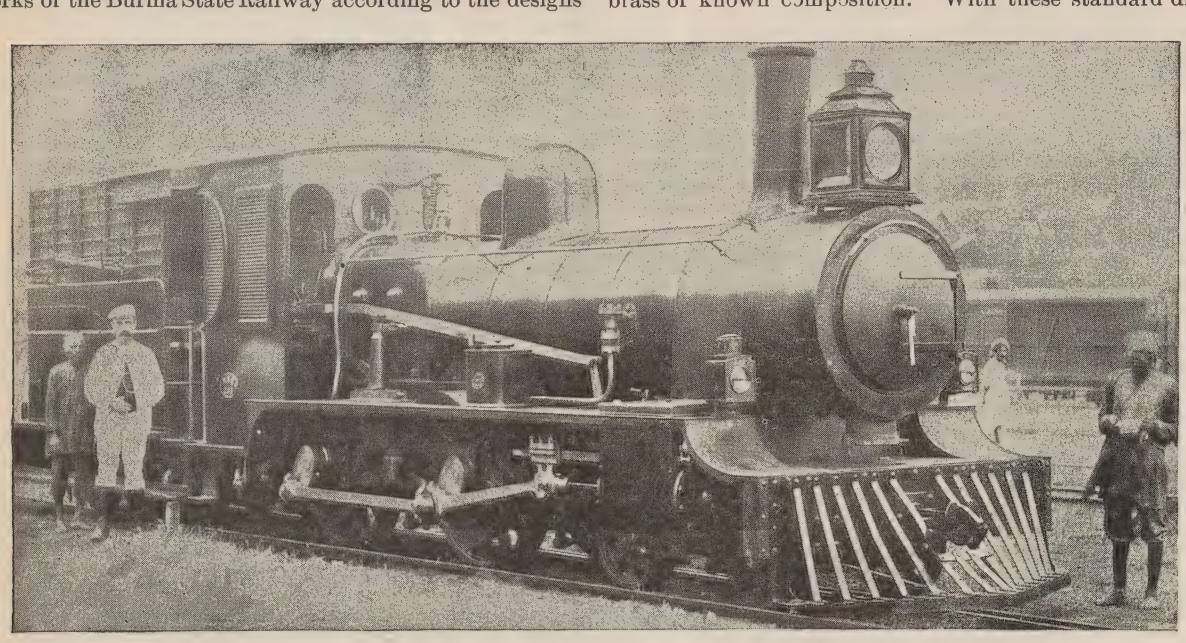
It is the custom of this paper to publish items concerning exceptionally notable occurrences or objects in the whole range of human action. Thus we have told our readers of the longest canal, the shortest railroad, the strongest rope, the thinnest wire, the highest railroad and telegraph lines, the deepest hole, the largest and the smallest paintings, etc. Here is the record of a performance that is, as far as we know, unsurpassed, and, we believe, unsurpassable. A woman on Prince Edward Island gave birth to five daughters July 28. Her husband is in his 84th year.

A Baltimore dispatch says, in regard to the electric locomotive employed for hauling trains through the tunnel, that it is the general opinion that while the present motor has shown its capacity to haul heavy trains, yet the overhead structure and other objections which have developed will make the present outfit so unsatisfactory that it will in all probability not be accepted by the company. It is said that between 2,000 and 3,000 horse power of energy are required to start the motor with its load, and that the transfer of this amount of energy from the trolley line has been the occasion of much of the difficulty so far experienced.

What safety can there be for any of us when such idiots as the following reports are alive and at liberty? A crowd of Knights of Pythias occupied an excursion train on the "Big Four" road, August 5. They had a cannon in the baggage car which they fired off at frequent intervals while running. It was fired just as another train was passed at Bellefountaine, O., bearing the Third Regiment of the Ohio National Guard. The heavy wadding and powder being discharged into one of the coaches only two or three feet away, and injuring about 25 persons. Two or three will probably lose their sight, while an equal number have been made deaf. The injuries of the remainder consist of pain ful burns.

Indian Railway Rolling Stock.

In our last February issue we published photo-engravings and descriptions of several types of freight and passenger cars used on the Burma State Railway of India. We also then illustrated and described the standard freight locomotive in general use on Indian roads. We are indebted to Mr. C. E. Cardew, Locomotive and Carriage Superintendent of the road named, for the following information and illustrations of an additional passenger car and passenger locomotive in use on his road. The car shown is the standard third-class car with four-wheel trucks. The view presented shows the arrangement of end handholds and steps provided, also the coupling arrangement. The costume of the adjacent trainman would hardly be considered in good form on an American railroad, but its airiness can hardly be questioned, and that, doubtless, is the main necessity in India. The car shown was built at the Insein works of the Burma State Railway according to the designs



Standard Passenger Locomotive Burma State Railway.

of Mr. Cardew. The body is built wholly of teak, the top and bottom side rails being in one piece, each 40 feet long. The car is painted a dark yellow, with chocolate colored moldings, the iron work painted black. It is divided into eight transverse compartments with side doors. Each compartment seats ten persons, and is separated only by trellis work walls. The under frame is made of steel, the longitudinal members being 40 feet long by 2 feet 9 inches high. The trucks are made of steel and have swing bolsters, and steel-tired spoke wheels 28 inches in diameter. The car stands 11 feet high. The floor width is 7 feet, and the inside headway is the same. The width over the sunshade is 8 feet 6 inches.

The locomotive shown is known as the class "O" type and has 14-inch by 20-inch cylinders, and coupled driving wheels 4 feet 5 inches in diameter. The total wheel base of the engine and tender is 30 feet 4 inches. The engine weighs, in working order, 23½ tons, and the tender, loaded, 15½ tons. It handles trains of 200 tons, easily maintaining an average speed of 25 miles an hour. It was built by Messrs. Dübs & Co., of Glasgow.

A Worthy Tribute.

The following tribute to the memory of Mr. A. N. Towne, the late General Manager of the Southern Pacific, is taken from the Los Angeles *Times*. Those who have the good fortune to know Mr. Towne will endorse every word of it:

"A gallant and noble soul slipped away into the great hereafter the other day in San Francisco when A. N. Towne died. No greater man ever wielded power in the service of a great railway system than did he. Earnest, honest, loyal, zealous, quick to know merit when he saw it, fair-minded, sympathetic, generous, he was every inch a man. He never reached the point where he was too lofty to give even the humblest employee a hearing and a fair show. When the boys went in 'off the line' and called on him with a grievance he listened, and if they were right, he acted as far as the power was given him to act. Though he reached one of the very highest positions in the railway service, coming up from the very lowliest place, he was ever the same modest, quiet, kind-hearted gentleman with a masterly knowledge of human nature, consideration for its failings and generous with applause. If ever in all this wide and weary world of toil and care a man won his way by sheer force of merit it was won by A. N. Towne, and it is good to know that he achieved a material success in no small measure, as well as that still greater success, the love and admiration of the men who worked under him. Such men as he sweeten life on the planet earth. They give evidence that with all the care and stress of life there is much in being brave, generous, kind-hearted and charitable—that one may rule without the crack of the driver's whip, and may at last fall asleep embalmed in the tender memories of his fellow-men. Great, kind, gentle spirit that sleeps under the heaped-up blossoms in Mountain View, we who honored and respected you in life will mourn you long, and longer still will we wait to see your like again."

The Color of Brass.

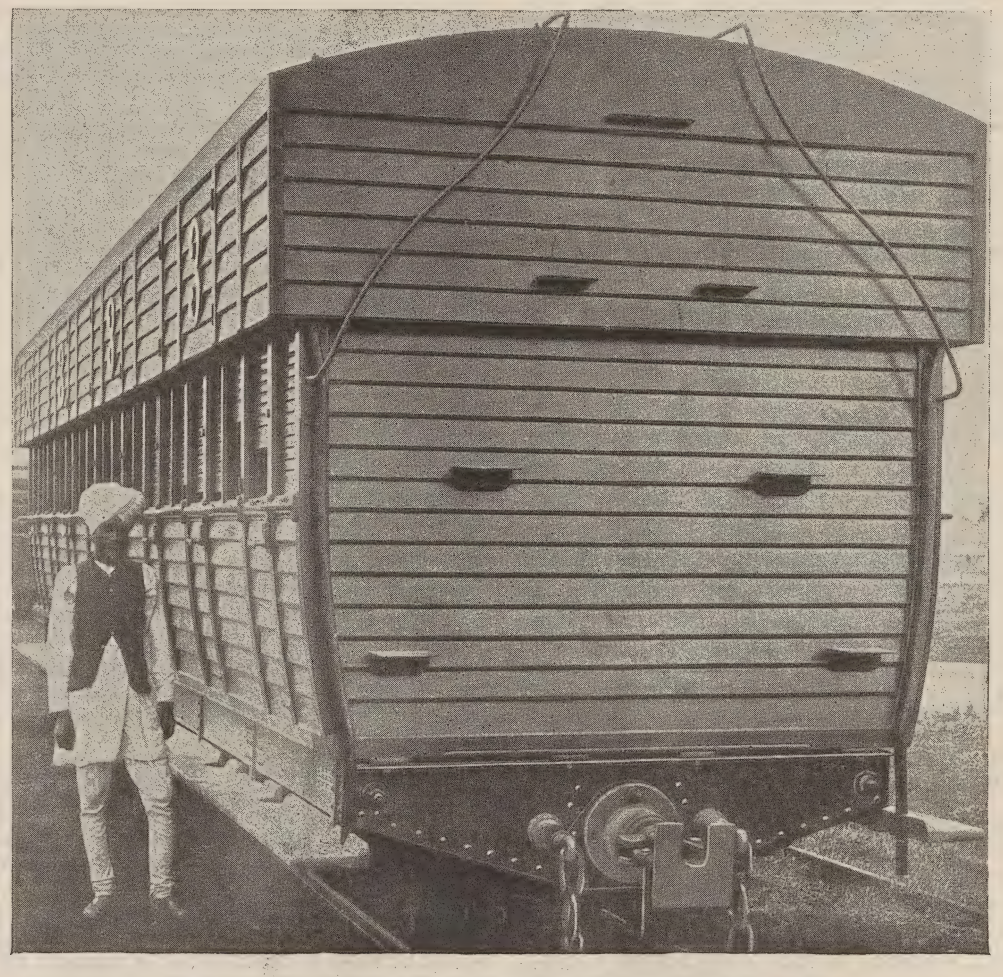
So long as anything has been known as to the nature of the alloy of copper and zinc, certain distinctive colors have been associated with certain classes of brass. No attempt, however, has hitherto been made to distinguish the minute gradations of shade corresponding to slight modifications in the percentage composition, or to apply these variations systematically to any practical use. At a recent meeting of the British Society of Chemical Industry, Walter G. McMillan read a paper, quoted in a London plumbing journal, in which he described a system which he devised about a year ago, by means of which it is possible to form an approximately accurate opinion of the composition of any given sample of brass merely by observing the color of drillings or shavings prepared from the sample. In order to effect this satisfactorily, it is necessary to have at hand a set of sealed glass tubes containing drillings of brass of known composition. With these standard drillings the drillings of any sample whose composition is desired to be known are compared. When the color of the sample is matched with that of a standard tube it is warrantable to assume that the known composition of the standard is approximately that of the sample. In this way the quality of any sample of brass may be rapidly determined by any buyer or user who is not color-blind and is possessed of average intelligence, thus avoiding the expense, labor and expenditure of time which would be occasioned if the sample had to be analyzed.—*The Iron Age.*

The South Indian Railway.

The South Indian line is one of the latest extensions of the general railway system which the imperial policy of England has promoted in her Indian Empire. Like nearly all the Indian lines, it has been constructed and is operated by a company under the guarantee by the Indian treasury of a minimum percentage return on the capital employed. In this way the government has been able to exercise a complete control over the construction of the Indian lines, and they also to a considerable, and probably very necessary extent, control the mode of working and the rates both for passenger and goods traffic over the lines. The South Indian line is on the narrowest gage of any as yet in operation in the peninsula, being only three feet three inches. Some doubt as to the paying character of the traffic on the projected line may probably have been the cause of this more economical scale of construction, but if so the results must have proved that all fears on this score were unfounded. The line is well constructed and well operated, and, to judge by the traffic both in goods and passengers at present, it ought to be an excellent investment for the company, as well as an inestimable benefit to the people of the districts through which it passes.

The use of the eight-wheeled car, in common with all other Eastern possessions of Britain, has proved a great success. The natives of all classes have taken so strong a fancy to their use in preference to the old four-wheeled cars that they have almost entirely superseded them. They all open from the side, on a level with the platforms of the line, and are singularly well adapted to the requirements of the country and climate. The saloon carriage on this line fairly represents the first-class accommodation, and renders traveling as comfortable as the circumstances of heat and dust will permit.

First-class passengers are, however, the exception on an Indian railroad. It is not to the few Europeans or natives of high rank that the companies have to look for their returns, but to the teeming thousands of the common people, who crowd the second-class compartments and overflow the railway platforms in a living tide. They, of course, have no saloon carriages; indeed, the narrow compartments into which the second-class carriages are divided leave so little room for each passenger that one can only wonder that they care to travel at all, and yet they are popular to an extent which astonishes a stranger. At each station the trains land seething crowds of white-robed passengers, and embark other crowds eagerly waiting for room, so that the railway platforms are among the most vivid scenes of native life to be seen in passing through the country. — *Harper's Weekly.*



Standard Third Class Passenger Car, Burma State Railway.

Over 4,600 horses were relieved from street railway service in the State of Pennsylvania in the three years ending June, 1894, according to the report of the Pennsylvania Secretary of Internal Affairs.

The value of electric street cars varies from $1,000 to $4,000, the average being about $2,500.

The reason for oil barrels being generally painted blue is said to be because blue has been found, by experience, to be more effective for keeping in the oil than any other pigment.

From time to time it is announced that plans are on foo to consolidate the Pennsylvania and Burlington railroad systems. It was revived late in July, but was contradicted by First Vice-President Thomson of the Pennsylvania.

It is the purpose of the management of the Cotton States and Internationel Exposition to make Sept. 18, the opening day of the Exposition, a notable occasion in the history of Atlanta and of the country. All business houses of the city will close at noon on that day.

Master Mechanics' Association Committees for 1896.

Following is a list of the subjects chosen for investigation by the Committees of the American Railway Master Mechanic's Association during the coming year:

Exhaust Nozzles and Steam Passages (continued).

ROBT. QUAYLE, WILLIAM FORSYTH, JAMES MCNAUGHTON, W. S. MORRIS, D. L. BARNES.

Couterbalancing Locomotives.—To submit practical and simple rules and methods, which can be introduced into locomotive shop practice for counterbalancing locomotive driving wheels.

E. M. HERR, W. H. LEWIS, C. H. QUEREAU, S. P. BUSH, W. F. M. GOSS.

Slide Valves.—To consider different types of balanced valves, their economy and efficiency over plain unbalanced slide valves, and what difference in economy and efficiency (if any) would result if above types of valves were provided with the Allen port.

G. R. HENDERSON, W. H. THOMAS, E. E. DAVIS, PHILIP WALLIS, L. R. POMEROY.

Reciprocating Parts.—What lines should be followed in reducing the weights of reciprocating parts of a locomotive. Submit drawings showing how the general design of crossheads, pistons, rods, etc., can be reduced in weight without sacrifice of strength.

H. D. GORDON, C. F. THOMAS, C. G. TURNER, T. A. LAWES, John A. Hill.

Cylinder Bushings.—Can worn cylinders of locomotives be bushed with economy, and would it be economical to apply bushings to new cylinders, renewing the bushings from time to time as they became worn? How should such bushings be secured?

J. N. BARR, J. H. MCCONNELL, JOHN S. CHAMBERS GEORGE F. WILSON, W. H. MARSHALL.

Hub Liners.—To submit the best method for taking up lost or lateral motion between driving wheels and boxes, and for securing hub liners.

R. H. SOULE, MORD. ROBERTS, W. T. REED, A. J. CROMWELL, F. B. MILES.

Steam Pipe Joints.—To consider the present location and angle of steam and exhaust pipe joints on the cylinder saddle, the action of the cinders and heat upon them, and advise if it would not be beneficial to change their location and angle to overcome some of the trouble now experienced. Drawings to be submitted with recommendations.

GEORGE GIBBS, E. A. WILLIAMS, JOHN HICKEY, J. J. ELLIS, JOHN Y. SMITH.

Driving Box Wedges.—What service may be expected with stationary wedges as compared with movable, and how should the driving-box fit be made if stationary wedges are used?

J. DAVIS BARNETT, H. A. CHILDS, T. J. HATSWELL, R. ATKINSON, R. E. REDDING.

Steps and Handholds.—To submit the best design and location of handles and steps for each type of engine and tender.

JOHN MEDWAY, H. BARTLETT, J. T. GORDON, F. M. TWOMBLY, GEORGE H. BAKER.

Truck Swing Hangers.—To advise the proper angle for swing beam hangers in locomotive trucks.

G. L. POTTER, W. LAVERY, W. GARSTANG, JOHN MACKENZIE, M. N. FORNEY.

Locomotive Grates.—What kind of grate is the most suitable for burning anthracite coal—the cast-iron shaking or the water bar?

H. WADE HIBBARD, GEORGE W. WEST, B. CLARK, DAVID BROWN, E. L. COSTER.

Thickness of Engine-Truck Wheel Flanges.—To report on the safe limit of flanges on the wheels of forward engine trucks.

P. LEEDS, G. W. RHODES, R. M. GALBRAITH, A. F. STEWART, W. D. CROSSMAN.

The Apprentice Boy.—Best method of training. What means can be adopted to improve his technical education?

W. F. BRADLEY, C. E. SMART, F. D. CASANAVE, A. E MANCHESTER, H. P. ROBINSON.

To Harmonize Standards.—To adjust dimensions on Standard sizes of tubes to agree with recommendations of standard on gages for sheet metal, tubes, etc.

W. SWANSTON.

Announcement of the Result of M. C. B. Letter Ballot.

The Secretary of the Master Car Builders' Association makes the following announcement:

The Letter Ballot which closed July 29, 1895, resulted as follows:

SUMMARY OF VOTES AND RESULTS.

Subjects Voted on.	Question.	Number of Votes Cast. Affirmative.	Negative.	Total.	Number of votes necessary for adoption.	Results of Ballots.
Air Brake Tests.....	a	847	35	882	588	Adopted.
Standard Size for Postal Card Circulars	b	867	8	875	583	Adopted.

JNO. W. CLOUD, Secretary.

A passenger train on the Pickering Valley Railroad was ditched three miles from Phœnixville, Pa., August 4, by running over a cow. The engineer was killed and the fireman and six passengers were fatally injured.

Master Car and Locomotive Painters' Association.

The twenty-sixth annual convention of this Association will be held at Cincinnati, O., Sept. 11, 12 and 13. The following is a list of the subjects to be reported on by committees and considered:

What is the best material and method for interior cleaning of passenger coaches that are not to be varnished inside, mild soap with water, or one of the modern car renovators? Also report what different material and method you would employ if the inside is to be varnished?

J. G. KEIL, C. L. HARWOOD, D. A. LITTLE.

What is the best material and method for the exterior cleaning of passenger equipment preparatory to varnishing?

JOHN RATTENBURY, J. H. STOUT, JOHN HARTLEY.

What is the cause, prevention and cure of those numerous cracks that run mostly in parallel lines at right angles with the grain of the wood on the painted and varnished surface of passenger equipment? Are they caused by shrinkage or vibration of the wood, by non-elastic or wrong varnish, by poor painting or what?

J. H. PITARD, A. HUNNICKE, J. R. BARR.

Essay—A quarter century in the Railway Equipment Paint Shop; its past experience, present lessons and future prospects. WARNER BAILEY.

The best method, material and means of removing the old paint and varnish from the exterior of a standard passenger coach, with the detailed expense of labor and material of one coach body. Also should a burned-off coach be smoothed by carpenters with planes and veneer scrapers before it is painted to insure a good and durable job? If so, what is the extra cost, and does it pay?

R. MARENGO, L. E. OWEN, HENRY BLOCK.

Is it advisable to continue the use of rough stuff and lump or block pumice stone in surfacing burned-off paneled coaches, or is there another method and formula whereby satisfactory results can be obtained at less cost of labor and material?

J. H. WORRALL, SAMUEL COOPER, ROBT. SHORE.

What is the best color and what are the best materials, and why, with which to paint and letter freight equipment, considered in the light of economy and durability, and is it advisable to varnish the outside of caboose cars when economy and durability are considered?

A. J. BRUNING, CHAS. BECKER, ROBT. MCKEON.

Essay.—The present conditions and future prospects of our trade. Does it afford sufficient attraction for an intelligent class of apprentices? Why, or why not?

JAS. A. GOHEN.

Is there any reliable substitute for linseed oil as a priming vehicle and with which to mix to some extent all subsequent surface coatings, speed, durability and economy being considered? What has been your experience the past year and what is your present opinion of ready prepared primers and surfacers, without names (supposed to contain little or no lead) over the old lead and oil system? Have you any growing convictions in favor of the former materials over the latter?

WM. O. QUEST, J. A. P. GLASS, F. S. BALL.

What has been your experience the last three years with a primer for iron? Have you found anything that will resist the action of rust on a locomotive tank?

J. H. TAYLOR, JOHN MCMURTRY, DAVID JAMES, CHAS. A. COOK.

The exterior striping, decoration and lettering of a standard passenger coach with detailed cost per car, accompanied with descriptive drawings showing styles of letters most appropriate for this work, also ornaments and general plan.

J. T. MCCRACKEN, AUG. WOLTER.

The following subjects will also be discussed:

Query List.

Is there any practical and economical method by which the old paint or varnish can be safely removed from old car blinds?

In the light of durability and economy, is shellac the best article to apply as a surfacer over a paste filler on interior wood finish of passenger equipment, preparatory to varnishing?

What is the best method, economy, finish and durability being considered, to do car trucks and steps; to clean and varnish; clean, paint and varnish; or clean and give one coat of varnish color or oil paint?

What is the best formula for a truck and step color for a passenger equipment painted Pullman, body color, economy, appearance and permanence being considered?

How often, on an average, should passenger equipment roofs be painted? Should they be painted for the sake of appearance every time the bodies are varnished, which is about once a year, and what is the best material?

What objection, if any, is there to painting passenger coach end doors outside with the body color (provided that it is a dark color) instead of finishing them in the natural wood and keeping it up? Is it not in the interest of economy, considering the abuse the lower portion gets by kicks, which is easily remedied with a coat of color before varnishing?

Would one be justified in sanding the bull nose on the roof of a coach for durability's sake?

Is it advisable for the Association to employ a practical chemist so that if any member in good standing desires a test made he is at liberty to send to him?

What would you recommend as a limit for the number of apprentices in the paint shop?

Is it advisable to bronze the seat back hangers in a coach? If not, what would you recommend?

The Chicago, Peoria & St. Louis will be sold Sept. 14, by order of the United States District Court at Springfield, Ill.

Master Blacksmith's Association.

The annual meeting of the National Railroad Master Blacksmith's Association will be held in Cleveland, O., beginning Sept. 3. The following is the list of subjects to be reported on, with the names of the chairmen of the committees:

Axles, Best Methods for Preparing Scrap for, and Manufacturing.—J. G. HEMPSTEAD, Wodin Car Mfg. Co., Berwick, Pa.

Springs.—W. W. MCLELLAND, D. & R. G., Denver, Col.

Hydraulic Forging, Bull Dozer, Forging, Bending and Cutting Machines, Hammer Dies, etc.—HARRY JEFFRY, Pittsburgh Lo. Wks., Pittsburgh, Pa.

Tool Steel, Tool Making, Tool Dressing, Tempering of Tools, Uses and Treatment of Low and High Carbon Steel, Self-Hardening Steel, its Advantages, etc.—G. H. JUDY, P., Ft. W. & C., Ft. Wayne, Ind.

Locomotive Frames, Report on Best Method for Making and Repairing of Same.—C. H. WILLIAMS, Cinn. Southern, Ludlow, Ky.

Welding, Best Methods and Best Results.—WM. ALEXANDER, C., M. & St. P., Milwaukee, Wis.

Furnaces and Fuel, To Consider and Report Upon the Best Design for Economy in Fuel, etc.—A. L. WOODWORTH, C., H. & D., Lima, O.

Proper Material for, and Best Methods of Making, Side Rods, Crank Pins and Motion Work in General.—JOHN BUCKLEY, Ill. Cent. R. R., Chicago, Ill.

The Secretary announces that the purposes of the National Railroad Master Blacksmith's Association is to discuss matters pertaining to blacksmithing, and likewise "to expose the shortcomings and clannish instincts developed by all trades and specialties."

French Four-Cylinder Compound Locomotives.

Mr. C. Baudry has contributed an article to the *Revue Generale des Chemins de fer*, giving particulars of some four-cylinder compound locomotives put in service on the Paris, Lyons & Mediterranean Railway in 1893, we are indebted to and excerpt from the minutes of the *Proceed ngs* of the Institution of Civil Engineers for the following translated abstract of the article. The new engines have eight coupled driving wheels, 4.92 inches in diameter, and are used in miscellaneous service. Their performance is compared with that of simple engines put in service in 1881, and compound engines put in service in 1888. Similarly to the 1888 engines the steam in the newer engines passes directly from the boiler to the high-pressure cylinders, from these it proceeds to the low-pressure cylinders. The four valves actuated by the "Walschaert" gearing are reversed by one steam-controlled mechanism, which ensures a proper relationship between them, independent of the engine-driver, for each position of the lever. A special cock allows the engine-driver to send the steam direct from the boiler into the intermediate steam-chest between the high-pressure and low-pressure cylinders, for starting only, and without the steam leaving the high-pressure cylinder and escaping to the air; a spring safety-valve placed on the chest and communicating with the air prevents the pressure rising above 100 pounds per square inch.

In comparing the consumption of fuel, it was found that there was an average of saving in the 1888 type, compared with the non-compound type of 1881, of 10.5 per cent. In comparing the new engines with those of 1881, an average saving of about 13.5 per cent. was found.

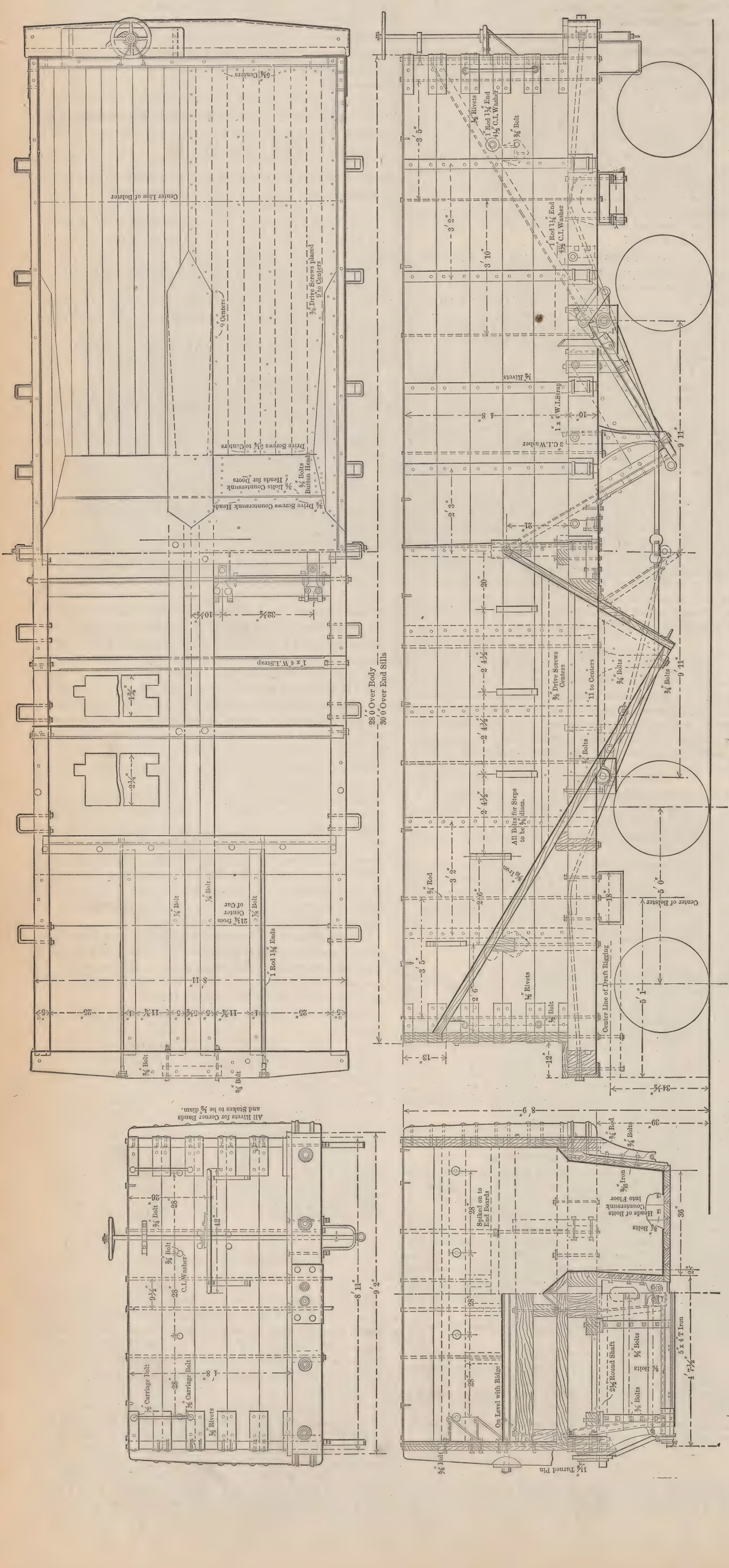
The following are the principal dimensions of the new engines:

Weight.....	49.08 tons.
" in working order.....	52.35 "
Interior diameter of the boiler shell...	4.59 feet.
Steam pressure.....	213 pounds per square inch.
Number of tubes.....	139
Length of tubes.....	9.84 feet.
Exterior diameter of tubes.....	2.56 inches.
Heating surface of tubes (interior)..	1,555 square feet.
" " of firebox	105 "
Total heating surface.....	1,660 "
Grate area.....	26.47 "
Diameter of cylinders, high pressure..	14.17 inches.
" " low " ..	23.23 "
Stroke of piston.	25.59 "
Number of cylinders..	4
Diamater of driving-wheels.....	4.92 feet.
Wheel base between extreme axles....	18.80 "
Total length of engine....	32.05 "
" width of engine.....	9.19 "

Open Car Windows.

A correspondent of the New York *Tribune*, writing of open car windows and the disagreeable draft from the same, suggests that screens similar to those used in sleeping cars be provided for coach windows, and that only trainmen be allowed to place or remove them. A lady writing to the same paper suggests original tactics by the person annoyed:

"Simply raise your umbrella or parasol in front of you, so that the wind, cinders, dust and smoke blow from your umbrella on the back of the neck of the person who sits by the window in front of you. A very few minutes suffices to convince this person that the wind is blowing harder than he thought, and is very disagreeable and uncomfortable, so down goes the window, and also the umbrella, with a quiet smile of gratitude and content with the result of self-protection."



70,000 Pounds Capacity Coal Car, Pennsylvania Railroad.

By the courtesy of Mr. G. L. Potter, Superintendent of Motive Power of the Pennsylvania lines west of Pittsburgh, we are enabled to present herewith drawings showing the construction of a self-clearing hopper-bottom coal car designed by him for use on the Northwest system of the road named. The ability of the car to empty itself is secured by the hopper-like floor, there being no flat floor in the car. At the ends the floor slopes from about 10 inches of the top of the car to the bottom of the hopper, the hoppers being separated by the steep slopes formed by the doors Each hopper is also divided by a longitudinal ridge, and there are four inclined doors with openings 27 inches high and 36 inches wide. The doors are operated by levers from a square shaft at the side of the car, to which a loose crank-handle is applied when the doors are to be operated

The arrangement of these doors is one of the notable features of the car, they being so hung as to be nearly vertical, and to be at the same height above the track when open as when closed, so that the hopper can be lower than when the ordinary drop doors are used. In this way greater carrying capacity is obtained, together with a steeper slope for the floor of the hopper, both very desirable features.

The end sills are 10 inches by 9 inches. The side and center sills are 10 inches by 5 inches, and the two short intermediate sills are 10 inches by 4 inches. These extend back to the transverse timber, which supports the floor of the hopper. Along each of these short sills is a one-inch rod, with 1¼-inch ends, bolted through the end sill and the transverse timber. The frame is trussed by two 1½-inch rods, with 1¾ inch upset ends, placed against the inner side of the side sills, the rods being bolted through the end sills, and passing up over a saddle and then down at the side of the hopper, the ends being connected by an open-side turnbuckle. The draft rigging is placed between draft sills below the main sills.

The sides of the car are supported by 5-inch by 3½-inch stakes, placed as shown on the drawing. The sides are made of 3-inch by 11-inch boards, and have iron corner plates riveted in place, and an iron strip on the top edge, this being secured by ½-inch by 2-inch lag screws and ¾-inch vertical rods passing down through the sides and sills. The side boards are secured to the stakes by ½-inch bolts riveted over. The floor is made of tongued and grooved planks 5½ inches by 2½ inches. The doors of the hopper are made of 5½-inch by 1¾-inch planks, tongued and grooved. The floor, slopes and doors are covered with a $\frac{3}{16}$-inch steel plate, secured by ⅜-inch drive screws with countersunk heads.

The car is 30 feet long over the end sills, and 28 feet long over the body. It is 8 feet 11 inches wide over the body, and the same over the side sills. The hopper is 3 feet 8 inches wide at the bottom, and is 7 feet 5 inches deep, the size of the bottom being 36 inches by 31 inches. The total weight of the car is 35,000 lbs. This with a full load will make the weight per wheel somewhat over 13,000 lbs. The cost of the car is about $550.

Our illustration of the trucks shows these to be of the diamond type with 33-inch wheels. The wheel base of the truck is 5 feet, and the total wheel base of the car is 24 feet 10 inches, the trucks being 19 feet 10 inches apart between centers. The brakeshoes are hung between the wheels. The top arch bar is 1½ by 4 inches, the lower arch bar 1 by 4 inches, and the bottom tie-bar ½ by 4 inches. The spring plank is a steel channel 13 by 4 inches and ½ inch thick. The bolster is formed of two channels 7 feet 4 inches long, 3½ inches wide, 13 inches deep at the middle. The drawings show the construction so clearly that further description is unnecessary.

A departure is made in the arrangement of the brake gear, as shown in the drawings of this. There being an abundance of room above the sills beneath the ends of the hopper, this space is utilized to carry the reservoir and brake cylinder, while the train-pipe is carried along the center of the car, under the longitudinal ridge which traverses each hopper. The main lever, to which the piston rod is connected, is, therefore, in a vertical plane, and its upper end is journaled on a bracket bolted to the inside of the end of the car.

The Schoen pressed steel body and truck bolsters will be used in the 1,000 duplicates of this car that are being built at the company's shop at Altoona, and by the Union and the Barney & Smith car companies. The Westinghouse airbrake will be used on all these cars. The Janney coupler will be used on 700 of the cars, and the Tower coupler on 300 cars.

Pennsylvania Railroad 70,000 Pounds Capacity Self-Clearing Coal and Ore Car.

Niagara's Energy Harnessed.

After almost five years of work and the expenditure of over $3,000,000, Niagara has finally been harnessed, and the power generated by the monster 5,000 horse-power dynamos of the Cataract Construction Company is now sending out the electricity for commercial use. The first power was delivered to the works of the Pittsburgh Reduction Company, of Niagara Falls, N. Y., at 7.30 a. m., Aug. 26. Everything was found to work perfectly, and great satisfaction was expressed by the officers.

Reorganization of the Erie System.

The plan for the reorganization of the Erie Railroad system was made public July 26. It proposes to create a new company which shall absorb the Erie and its various branches, also its leased or controlled lines, the New York, Pennsylvania & Ohio and the Chicago & Erie, thus uniting the control of the entire system in one corporation as a through line from New York to Chicago. To carry out the plan the following securities will be created: One hundred and seventy-five million dollars first consolidated mortgage one hundred-year gold bonds, secured by mortgage, and pledge of all property acquired under the plan of reorganization by the new company. Of these bonds $35,000,000 will be 4 per cent. prior lien bonds, $140,000,000 will be 3 to 4 per cent. general lien bonds, $30,000,000 first preferred 4 per cent. non-cumulative stock, $16,000,000 second preferred 4 per cent. non-cumulative stock, and $1,000,000 common stock.

Of the prior lien bonds $14,400,000 will be used to go as part of the purchase price of the New York, Pennsylvania & Ohio; $15,000,000 will be sold to a syndicate, comprising $25,000,000 in money, which has been formed for the purpose, and which will succeed to all the rights of those holders of the preferred and common stock of the New York, Lake Erie & Western Railroad Company who shall not deposit their stock and pay the assessments thereon. Of these prior lien bonds also $5,000,000 are reserved for enlargement and improvement of terminal facilities, including elevation of tracks, additional wharf facilities at New York, reducing grades, constructing double track and purchasing additional equipment, to be used only with the consent of the voting trustees. The new general lien bonds will bear interest from July 1, 1896, at 3 per cent. per annum for two years, and 4 per cent. thereafter.

The assessments of the stock of the New York, Lake Erie & Western Railroad Company will be $12 a share on preferred stock and $18 a share on common stock, a reduction of $4 and $6 being allowed to depositors who deposit their stock and pay the first instalment of $2 and $3 respectively by Sept. 20.

The mileage of the new company will be 1,938 miles, being made up of 538 miles of New York, Lake Erie & Western, 600 of New York, Pennsylvania & Ohio, 250 of Chicago & Erie and 550 miles of the auxiliary branches of the New York, Lake Erie & Western.

The twenty-eighth annual report of the Boston and Albany Railroad Company, just issued, shows there was a decrease of 430 in the number of passengers carried, as compared with 1894, the total number being 12,151,670. The freight business, however, was largely increased, being 93,568 tons over that of last year, with a total of 3,994,340 tons. By the payment of the $2,000,000 of 6 per cent. bonds, which matured on July 1, the fixed charges for the coming year will be decreased $120,000.

The Chicago & West Michigan is preparing to transport its cars from Peshtigo, Mich., to South Chicago, a distance of 240 miles, by ferryboats. The two boats are the largest of their kind on the great lakes. Each is 317 feet in length by 44 feet in width, and has capacity for 28 cars. The first left Port Huron Aug. 20. The officers of the company say that as good time will be made by the ferryboats as by regular freight trains.

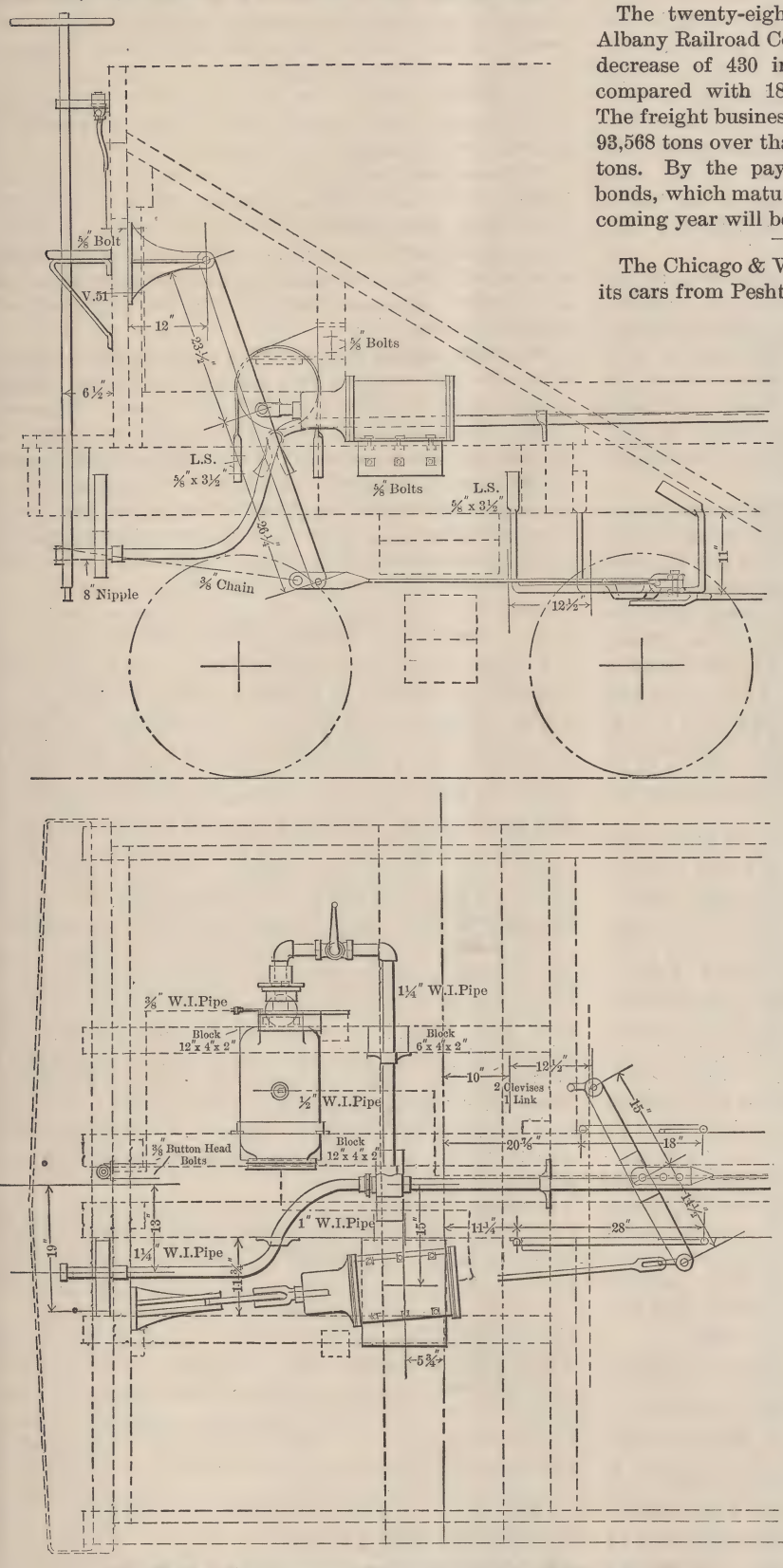
The *Potosi*, a ship just completed in Germany, is the largest sailing ship ever built. She is 394 feet long over all, 49 feet 9 inches wide, and 31 feet 2½ inches deep between decks. Her capacity is 6,150 tons.

The Port Royal & Western Carolina Railroad will be sold at auction at Greenwood, S. C., Oct. 17. The system consists of the following roads: The Augusta & Knoxville, extending from Augusta to Greenwood; Port Royal & Western Carolina, from Greenwood to Spartanburg; the Greenville & Laurens, from Greenville to Laurens, and the Savannah Valley, from McCormack to Anderson.

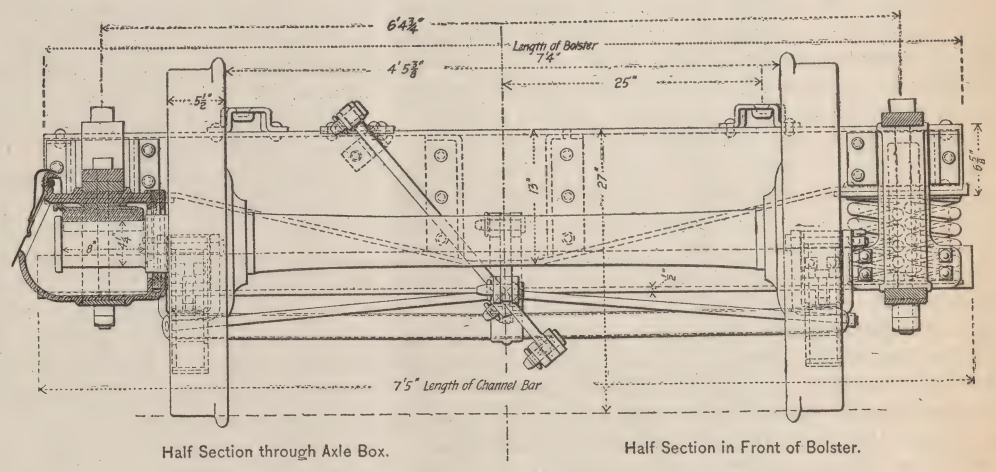
Philadelphia has abandoned every kind of motive power for street cars except the over-head trolley, there being only a few miles of line temporarily operated by horses. All cable lines have been abandoned. The significance of this change is emphasized by the well-known fact that Philadelphia is the greatest city in America in the matter of street railway interests. The change from cable to trolleys is due to the greater cheapness and facility of operation.

One of the most useful materials which have been found by the Board of Inspection and Survey of the Navy Department is a wood substitute composed of waste cork or any cork. This is subjected to 400 degrees of heat and it is then pressed into blocks of any required size. It can then be sawed into thin strips or handled very much as wood is handled. Cork has a gum which great heat melts and glues its particles together in a compact mass. After being pressed it sticks together as tightly as if it had grown that way.

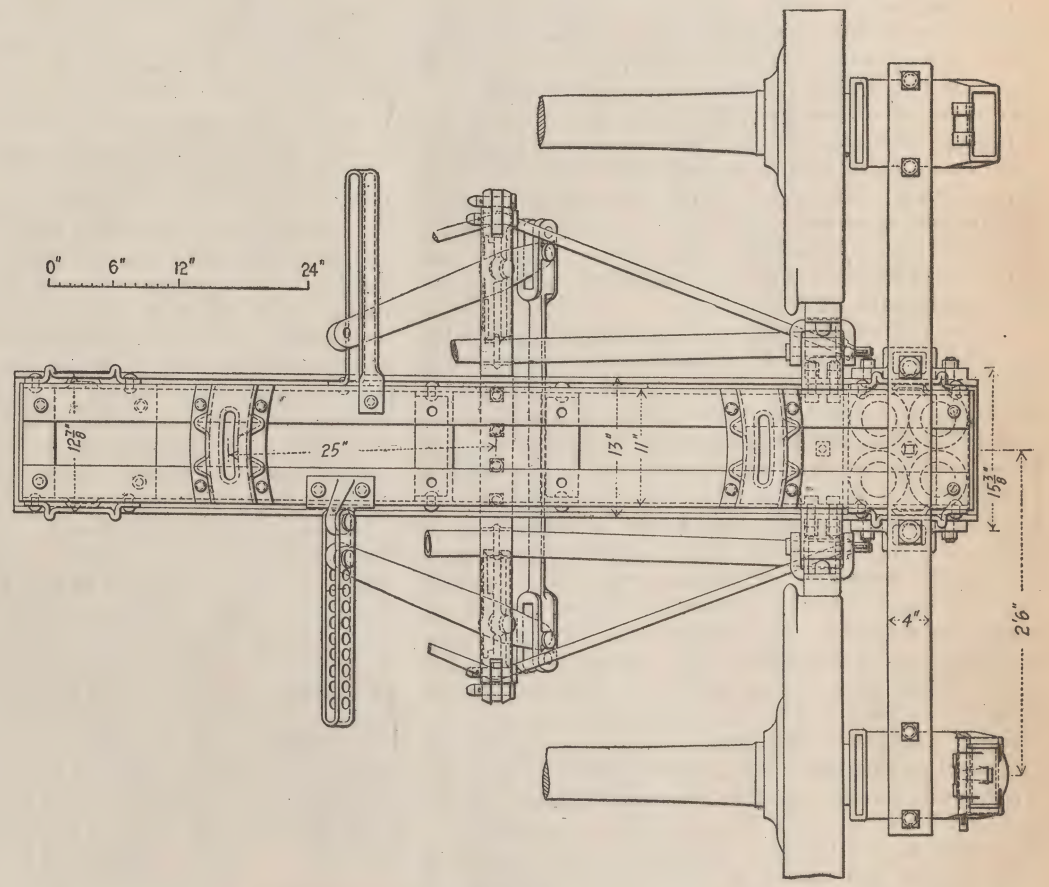
The St. Louis *Globe-Democrat* says that the army of Germany and the railway army of the United States contain about the same number of men. It is Uncle Sam's impression that he has decidedly the advantage in this arrangement.

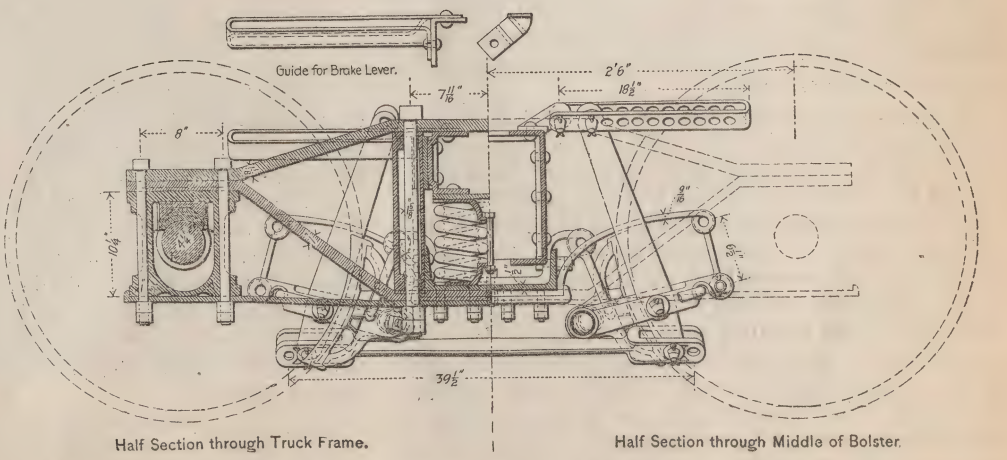


Air Brake Arrangement Pennsylvania R. R. Hopper Car.



Half Section through Axle Box. Half Section in Front of Bolster.





Half Section through Truck Frame. Half Section through Middle of Bolster.

Truck Details Hopper-Bottom Coal Car Pennsylvania Railroad.

Locomotive Repair Shop Equipment.—VI.

BY W. H. WESTON, M. E.

(*Continued from page* 117, NATIONAL CAR AND LOCOMOTIVE BUILDER *for August.*)

Practice differs so widely in the matter of boiler-shop tools that a great range is found in the various places, from very inferior to very good equipments. And probably a number of reasons exist for this; that is, in some instances a proper appropriation will not be made for the purchase and erection of new tools. And it may be, in other cases, that those in charge feel well enough satisfied with the "one-horse" equipment that they have and do not want to disturb the old-fashioned course of affairs; and so the work of the road goes on at a great disadvantage and an extra expense, or a small and ineffective amount and quality of work is turned out for the money that is spent for it.

As to whether a shop should do any part or the whole of the building of new boilers for the road is a matter dependent on the special circumstances of the situation. No doubt there are many shops that do not construct any new work that should do so, and that could do so to much advantage simply by extending the equipment a little. In most shops there are times when the amount of repair work will vary, and as it is not convenient or possible to vary the force of workmen whenever the work changes, it is economy and good practice to employ a part of the force on spare work at such times when not needed on repairs. In this way a large amount of new work can be done, and at the same time a sufficient force of workmen is always on hand to do the repairs. The result is that the yearly pay-roll of the boiler shops will have a much larger amount of work to balance it than if no new construction was handled. Another advantage in a road building its own boilers, is that it can have just what is wanted in the way of material, plan and workmanship, provided it has a properly equipped boiler shop. These three items are of importance in the matter of having good rolling stock, and having it maintained at a reasonable expense. In many cases, the cost of repairs on this part of the rolling stock of a road is far more than it should be because the boilers are built with inferior material or poor workmanship.

As to the tools required in a shop to do new work together with the repairs, if a shop is properly equipped to handle all the repairs that may be needed, it will come very near being sufficiently equipped to do any new work that may be wanted. For there are many times when new fireboxes must be put into the boilers, and new sheets put in at various points, etc. In order to properly handle all boiler repairs, there is needed a very complete equipment of tools, and if this is not had, extensive repairs cannot be properly done; or if attempted, it must be at an excessive expense, and at the same time they will usually be performed in a bungling, inefficient manner. Consequently it is an advantage to have a good supply of boiler-shop tools. The tools required in a boiler shop are large and heavy, but not at all extensive in number. And there is no fair excuse for not supplying a shop with the ones necessary for the performance of the work that a road may have, in an efficient and economical way.

Boiler shops can be found on roads even of considerable size that are equipped in a very inferior manner. For instance, they may have but one power machine (and that of only moderate size), for punching and shearing; one or two drill presses, and one or two small plate-bending rolls, together with the forges, etc. Now this is a very inferior equipment for a boiler shop in which to handle any railroad work, even if nothing but repairs are done; and, of course, it is impossible to do all the repairs in such a shop that may be necessary; or, at least, it is not possible to do them in an economical manner. On the other hand, an equipment to handle a fair amount of work at an economical figure should be supplied with tools somewhat as follows: A hydraulic riveting machine if much new work is to be done, a large power punching machine, a large power shearing machine, large power plate-bending rolls, medium and small plate-bending rolls, a tube sheet-boring machine, a power tube-welding machine, drill presses, small shears and punches, forges, etc. A pneumatic caulking tool is a very valuable addition to a shop, as by its use the work is done quickly, and also in a very uniform and thorough manner if the tool is used right. There is no difficulty in the operating of the tool, and as it strikes light, rapid blows, there is little chance for any injury being done to a seam while the tool is in operation.

In regard to the small tools for a boiler shop, such as drills, reamers, taps, punches, chisels, etc., there should always be an ample supply in every shop. They should be kept in a systematic order in a tool room adjoining the boiler shop, and with strict regulations in regard to their use and return to the tool room. By strict regulations is meant such that there will be no opportunity to disobey them, without the one using the tools having to stand the result of a failure to return them.

Although in large building departments it is advisable to have cranes capable of lifting an engine with cylinders, frames, etc., and transferring it, yet in repair shops of moderate size this is hardly necessary. But a traveling crane that will lift a boiler alone is a very effective tool in any shop of moderate capacity; it not being requisite to have it so arranged as to transfer its load to any part of the shop, but if it will travel 20 or 30 feet along the line of track, that is sufficient. This will facilitate the work very greatly, especially about the firebox, and will make the handling of a boiler an easy matter. Another arrangement of much importance is to have tram rails located overhead at each machine in the shop, and a suitable hoisting gear hung from each rail. This part of an equipment is often put into a shop in a cheap, bungling sort of way, and the results are not very satisfactory for the reason that, in order to secure good results, both the tram-rail and the hoisting gear must be substantial. When they are being put in it is about as cheap in first cost to have the best as it is to get a poor substitute, and in the long run it is much cheaper.

Regarding the equipment of a blacksmith shop, it may be considered that proper fires, hammers and first-class workmen are the only requisites. Yet a blacksmith shop should have more consideration than this, if it is to be as effective and economical in operation as it ought to be. Proper heating facilities and proper hammers for forging are of course the prominent points of importance in such an equipment, and should be given the first consideration in supplying a shop with tools.

Often little attention is paid to the construction, form or position of forges, and the result is that little mean ones are crowded into a shop, so that there is not half the room around them that there should be to facilitate the work. Frequently no efficient arrangement for cleaning the fire while in use is another objection. In putting in pressure blowers for the forges and furnaces, more care should be taken in regard to the size of the blower and of the blast pipes than is often done; it being the best plan to give all the details concerning the arrangement of the apparatus to a manufacturer of blowers and then go entirely by his suggestion. In this way many imperfect equipments will be avoided.

As to the use of heating furnaces, there are doubtless very many shops that do not have any, and in which it would be a great advantage to the road to have them. For instance, a road that must send to an engine builder whenever a frame or a part of a frame is required for any given engine is at much disadvantage in the matter of doing economical work, for the cost of buying the frames is not the only element—that of excessive time that the engine may be waiting for the frames is often of much more consequence, for every day that an engine is needlessly off the road means a great deal if the road is doing any business. Also it is sometimes of advantage for a road to make its own axles, and thus a heating furnace will be kept constantly in operation on economical production. If the waste heat from the furnace is conveyed to a boiler it will generate nearly all the steam necessary to run the entire plant, and this is an element of much importance in connection with the subject, for if the coal that would be required to fire the boilers is saved it figures a long way toward the economy of using a heating furnace.

The size and construction of a furnace, of course, must depend on the amount of work that is to be done. There is an objection to having to crowd a furnace, and also to having one excessively large, although perhaps the latter is preferable to the former; yet it is much better to have one that is well proportioned to the work. Thick, solidly built walls are essential to durability, and they should be constructed with an ample number of header courses throughout, and the whole thoroughly tied in. The lining of the furnace should be of the best fire brick laid in fire clay. Brick made from plastic clays should be avoided, as they are of inferior quality. Header courses should be used in the lining at proper spacing.

The crane in connection with a furnace should be of steel, and susceptible of easy and quick operation, and also powerful enough to handle any load that may be needed. It is also of much importance in handling heavy work to have overhead tram rails and hoisting gear at one or two of the forges. Next, a large shearing machine is of much advantage in facilitating the work, especially when stock is to be cut for making duplicates.

In all shops a small steam hammer is a necessity. Of course, if a heating furnace is used, a large hammer must be had, and in either case it is of great importance to secure machines that will work satisfactorily.

(*Concluded.*)

Divorced on the Train.

Marriages and births while not of frequent occurrence on railroad trains, yet sometimes do occur, but probably the following is the only instance on record of a divorce being granted *en route.*

A woman sued her husband for a divorce at Spring Valley, Wis. Just before the case was called, Aug. 10, the judge received an urgent summons to repair to an adjacent town. The train was already due to leave the station, and judge, plaintiff and counsel all boarded the cars; the evidence in the case was heard *en route,* and as the train pulled into Wyckoff, seven miles out, the Court handed the woman her decree.

A fire in the yard of the Cincinnati Southern at Cincinnati, O., Aug. 8, destroyed 17 freight cars.

Advantages of Injectors Over Pumps.

The following interesting information concerning the superiority of injectors over pumps for feeding locomotive boilers has been kindly sent us by Mr. R. M. Galbraith, General Master Mechanic of the St. Louis Southwestern Railway. The figures are from the annual locomotive reports from the year 1874, to and including 1879. Injectors were applied in 1876, and the result was as follows:

Average cost per mile run, 1874, '75 and '76, with pumps, 28.24 cents per mile Average cost per mile run, 1877, '78 and '79, with injectors, 25.1 cents per mile.

This was on a division of the Union Pacific through the Bitter Creek country, having probably the worst water for steam purposes in the United States. There was no change in the quality of water during the time mentioned, but the repairs and the fuel accounts decreased in the proportion as shown by the report. Wages during this time remained about the same.

There was a great deal of trouble from engines dying on the road while equipped with pumps; this trouble was almost entirely obviated by the use of injectors. When an engine equipped with pumps got to foaming very badly on the line, and it was necessary to stop for any cause, they would be short of water and not have sufficient to work the engine and "pump up," but with injectors they were invariably able to dampen their fire, and get a sufficient quantity of water in the boiler to rekindle.

The Adoption of Steel Rails.

A writer on the early history of American steel rails says that an inquiry as to the amount of steel rails in actual use made by the Railroad Commissioners of Massachusetts in 1870 showed that out of 57 railways 20 had made no trial of steel, 11 others had tried only a few by way of experiment and found them greatly superior to iron ones, and the remaining 26 had laid steel rails in amounts varying from 100 tons to 15,000 tons, and their reports were unanimously in favor of them. The whole amount of steel rails laid in 1870 probably did not exceed 100,000 tons, with perhaps 10,000 tons of such rails besides, the rails varying from 52 pounds to 67 pounds per yard, and manufactured, of course, both in Europe and America. Steel rails at this time cost from 50 per cent. to 100 per cent. more than iron ones, according to quality. The general opinion was that steel would outlast iron from 13 to 17 times, and it was found that the extreme brittleness which the rails were predicted to have at the midwinter temperature of the Northern States did not exist. The question of the superiority of the Bessemer rail for all purposes was yet to be settled.

In 1870 the Pennsylvania Steel Company were prepared to roll Bessemer steel rails up to 67 pounds per yard, and, with their influence and that of other manufacturers, the steel rail began to make large strides. Gradually the steel rail came to be universally laid where the wear was greatest, on steep grades and sharp curves. More rigid systems of inspection of quality were instituted, and the quality improved, the inspection given previously bearing no comparison to the thorough examinatiou made in England France and Germany. Satisfactory reports commenced to come in from all quarters. The iron rails laid in the Chicago yards of the Chicago, Burlington and Quincy railway had only lasted six weeks. They reported after two and a half years with steel rails that they showed no perceptible wear. The Chicago and Northwestern, the Michigan Southern, the Pennsylvania and the Philadelphia and Reading all equally indorsed them. Twenty years was considered a moderate estimate of the life of a steel rail on main lines, while 40 years or 60 years was considered the more likely time, judging from the experience gained in places where the traffic was extremely heavy and the rails wore out quickly. A writer in the Franklin Institute *Journal* for 1871 estimated that, allowing compound interest at 6 per cent, if the rails lasted 20 years the present saving per mile would reach $7,000, if 40 years, $11,600, and if they lasted 60 years the saving per mile would reach $13,000. While these extravagant estimates have not been quite fulfilled, it is interesting to notice them, as one is apt to forget the immense saving in railroad work rendered possible by the use of the Bessemer steel rail.

It was about 1870 that the American or flange rail came to be generally adopted in place of the double-headed or pear-shaped rail, and it is only fair to American engineers to say that their early adoption of this type has since been fully warranted by experience with it, it having proved more adapted than any other section for permanent ways. It must be admitted that the careful system of records of the durability of steel rails kept by French and English railways was not so elaborately carried out in America, nor was the same care taken in their handling and storage. Americans were not slow, however, to take up the steel rail, and all had by 1874 fully realized its advantages. Retarded as the Bessemer process had been by the conflicting claims of the Bessemer and Kelly patents, it was not until 1867 that Bessemer steel was a commercial product. The Cleveland Rolling Mill Company did a large amount of pioneer work in raising the quality of American rails in wearing quality. Americans may, however, fairly claim to have changed that long ago, and are now turning out a product, equaled it may be, but certainly not excelled by any manufacturers in the world.—*American Manufacture and Iron World.*

Single-Driver Express Locomotive, Philadelphia & Reading R. R.

The photo-engraving on this page shows the general appearance of a single driver express engine recently put in service on the "Royal Blue Line" trains of the Philadelphia & Reading Railroad. The engine was built by the Baldwin Locomotive Works, according to the designs of Mr. W. R. Hensey under the general direction of Mr. L. B. Paxson, Superintendent of Motive Power and Rolling Equipment of the road named. The objects aimed at are evidently high speed and fuel economy, and according to the reports of the engine's performance these seem to be satisfactorily accomplished. Sufficient weight, 48,000 pounds, rest on the drivers to enable the engine to start trains weighing as much as 400 tons without slipping, and the 13-inch and 22-inch diameter compound cylinders on each side develop sufficient power to attain high speeds. The large grate surface enables cheap (65 cents per ton) small grade anthracite coal to be used, and the unusually large fire-box heating surface is said to prove very efficient.

The engine weighs 115,000 lbs., and the boiler carries 200 pounds working steam pressure. The boiler is made of cast steel plates $\frac{5}{8}$ inches thick. The throat sheet is $\frac{1}{8}$ of an inch thicker than the shell of the boiler to prevent undue thinning where flanged. All parts are thoroughly stayed, with liners on the inside of the side sheets, providing double thickness of metal for the studs of the expansion braces. There are 324 $1\frac{1}{2}$-inch tubes. The firebox is of the Wootten pattern and is 114 inches long and 96 inches wide inside. The side, back and crown sheets are $\frac{5}{8}$ inch thick. The flue sheet is $\frac{1}{2}$ inch thick. Staybolts of iron one inch in diameter are used, screwed and riveted to the sheet. The crown sheet is supported by inverted "T" crown bars set $2\frac{1}{2}$ inches above the crown. The crown is supported by radial staybolts $1\frac{1}{8}$ inches in diameter.

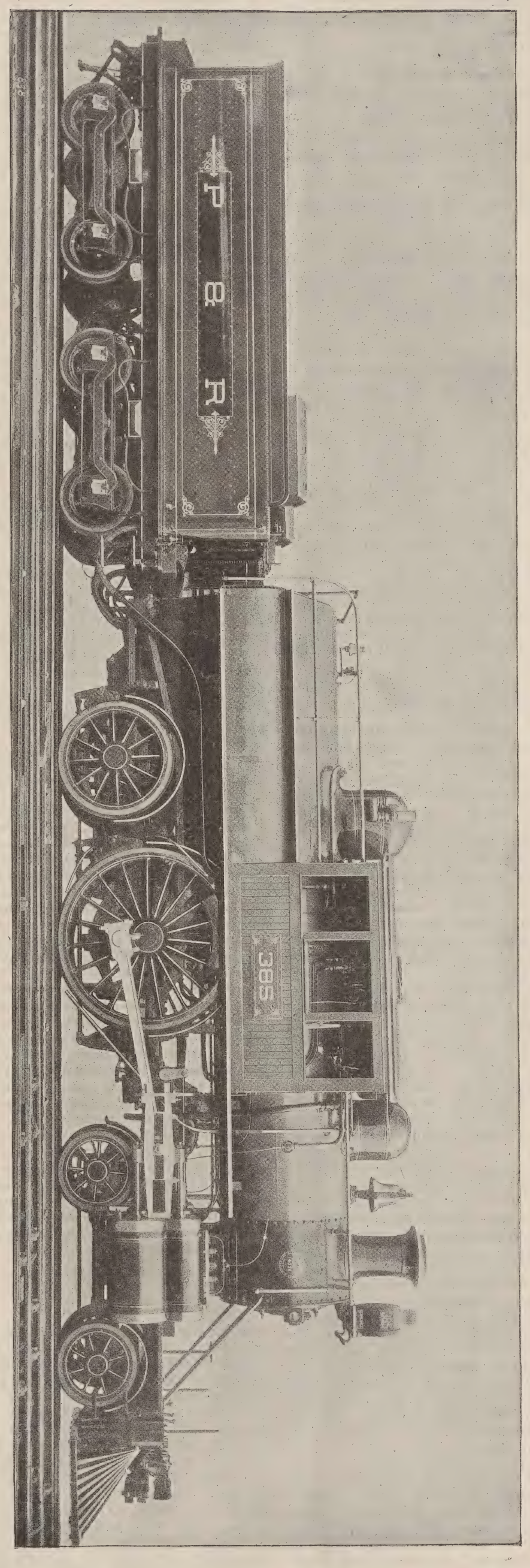
The frames of the engine are of hammered iron made in two sections. The four wheels of the front truck are of wrought iron 36 inches in diameter with steel tires. Their journals are $5\frac{1}{2}$ inches in diameter and 10 inches long. The two $84\frac{1}{4}$-inch driving wheels have steel centers 78 inches in diameter secured to cast-steel tires, $3\frac{1}{8}$ inches thick, by retaining rings. The engine is equipped with the Westinghouse automatic brake on drivers, trailing wheels and tender, a $9\frac{1}{2}$-inch air pump being used. The Leach pneumatic standing device is used, and the engine is also equipped with the P. & R. standard steam heat fixtures.

The capacity of the tank is 4,000 gallons, and it is provided with a water scoop. The tender frame is built of 8-inch iron channels strongly braced. There are two 4-wheel center bearing trucks with class "B" Boies wheels 36 inches in diameter. Brakes are provided for both trucks. The axles are of steel with outside journals $4\frac{1}{2}$ inches in diameter and 8 inches long.

The following table gives further detailed information of the engine's construction:

Gage	4 feet 8½ inches
Kind of fuel to be used	Fine anthracite
Weight on drivers	48,000 pounds
" " truck wheels	39,000 pounds; trailer, 28,000
" total	115,000 pounds
Wheel base, total, of engine	22 feet 9 inches
" " rigid	7 feet
" " total (engine and tender)	50 feet
Height of stack above rails	14 feet 3 inches
Drivers, number	2
" diameter	84¼ inches
" material of centers	steel turned to 78 inches diameter
Truck wheels, diameter	36 inches
Journals, driving axle, size	8½ inches diameter, 12 inches long
" truck " "	5½ inches diameter, 10 inches long
" trailer " "	7 inches diameter, 12 inches long
Trailer wheels, cast steel center, steel tire	54¼ inches diameter
Cylinders, diameter	H. P. 13 inches, L. P. 22 inches
Piston, stroke	26 inches
Valves, kind of	Piston, 11½ inches diameter
Boiler, working steam pressure	200 pounds
" material in barrel	Homogeneous cast steel
" thickness of material in barrel	⅝ inches
" diameter of smokebox end	56 inches
Seams, kind of horizontal	Butt joint
" circumferential	Double riveted
Thickness, crown sheet	⅝ inches
Crown sheet supported by	Inverted T crown bars
Heating surface	1,460 square feet
Tubes, number	324
" material	No. 13 W. G. iron
" diameter	1½ inches
" length	10 feet, 3 inches
Firebox, Wootten, length	114 inches
" width, inside	96 "
" material	Honogeneous cast steel
" thickness of sheets, side and back	⅝ inch
" water space, width	Front, 3½ inches; sides, 3½ inches, back, 3½ inches
Grate, kind of	Water tubes and bars
Smokebox	Short netting set vertically
Stack	Straight, with cast-iron top and steel base
Feed-water injectors	Two Sellers, 1887; No. 10½ on right side

New "Royal Blue Line" Express Locomotive, Philadelphia & Reading Railroad.



The Pennsylvania Railroad has arranged with New York City to operate a new line of ferries between Jersey City and the foot of West Twenty-third street, New York. The company now operates two lines of ferries between Jersey City and New York, one landing at the foot of Cortlandt street and one at the foot of Desbrosses street.

Tourists who go to San Francisco next year will find a new attraction in the scenic railway which will run to the summit of Mount Tamalpais, which commands a fine view of the city and the surrounding country for over 50 miles.

An excursion train on the West Jersey Railroad was run into by a following train at Liberty Park, N. J., Aug. 15, and the rear car was set on fire by the explosion of the headlight of the colliding engine. A number of passengers were injured, and one was burned to a cinder in the wreck.

NATIONAL CAR AND LOCOMOTIVE BUILDER

ESTABLISHED IN 1870.
PUBLISHED MONTHLY
BY
R. M. VAN ARSDALE,
MORSE BUILDING.....NEW YORK.

GEORGE H. BAKER, Editor.

HERBERT W. POOL, Business Manager.

SEPTEMBER, 1895.

Subscription.—*$2.00 a year for the United States and Canada; $2.50 a year to Foreign Countries embraced in the Universal Postal Union.*

EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING PAGES. *The reading pages will contain only such matter as we consider of interest to our readers.*

Special Notice.—*As the* NATIONAL CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, correspondence, advertisements, etc., intended for insertion must be received not later than the 25th day of each month.*

Contributions.—*Articles relating to railway rolling stock construction and management and kindred topics, by those who are practically acquainted with these subjects, are specially desired. Also early notices of official changes, and additions of new equipment for the road or the shop, by purchase or construction.*

To Subscribers.—*The* NATIONAL CAR AND LOCOMOTIVE BUILDER *is mailed regularly to every subscriber each month. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery, and in case the paper is not then obtained this office should be notified, so that the missing paper may be supplied.* **When a subscriber changes his address** *he ought to notify this office at once, so that the paper may be sent to the proper destination.*

REPAIR SHOP EQUIPMENT.

In this issue we conclude the series of articles on Locomotive Repair Shop Equipment, by Mr. W. H. Weston, that has been running for the last half year. In these articles Mr. Weston has treated the subjects of the equipment of machine tools for car and locomotive repair shops, small tools for the same, and their proper care, erecting shop equipment and boiler-shop tools. These have been treated in a practical, common-sense way, and yet in the light of the best modern practice. The author has shown very plainly that in such equipment as indicated it is always economy to get the most substantial and efficient tools to be had, even if the first cost is in excess of inferior articles, as the reduced cost of finished work rapidly compensates, much more than compensates, for the added cost. This is so well known to practical men that it seems hardly worth while to state the fact, much less to print columns upon it; but that these truths are not so well known and appreciated by many who influence and decide the purchase of equipments is plainly evident by the frequently seen inferior character of such. Mr. Weston's object in writing on these matters, and our object in publishing his articles, has been to call the attention of all concerned to the true facts of the case, to the end that repairs may be done more expeditiously and economically in railroad shops. Mr. Weston will soon begin another series of articles treating of further subjects of present practical interest to mechanical officers.

LOCOMOTIVE VALVE IMPROVEMENT.

One of the most promising fields of improvement of the locomotive is the arrangement of the valves to give improved steam distribution, and at the same time increase the useful work performed in the cylinders and reduce internal resistance. The Master Mechanics' Association has appointed a committee to investigate the merits of different types of valves, and we publish on another page an interesting and instructive article on Lead for Locomotives by Mr. C. H. Quereau, of the C., B. & Q. R. R., and who was for a number of years Engineer of Tests for that company, the investigations he then carried on qualifying him to speak with authority on matters of steam distribution.

In a paper contributed to the February, 1894, proceedings of the Western Railway Club by Mr. Quereau, the importance of increasing the valve travel was earnestly advocated, and it was shown that the tendency of this was to increase the port opening for a given cut-off, and the quickness of the opening, resulting in higher pressure in the cylinders and higher speed. The longer travel also gives a later exhaust opening and closure and a larger exhaust opening, all conducive to high speed and economy. A fuel economy of 10 per cent. was effected on some engines by increasing the valve travel from 5 inches to 5½ inches, and also resulted in such improved steam distribution that at a speed 13 per cent. greater there was 9.5 per cent. greater cylinder pressure.

In his present paper Mr. Quereau shows that the common belief that a certain amount of lead is needed to cushion the reciprocating parts is erroneous, as proved by the simple fact that an engine never runs so smoothly as when shut off. He maintains that most locomotives have too much lead, and that the proper adjustment of this will reduce internal friction, save coal, and find its chief advantage in saving repairs and avoiding time lost on the road by engine failures, and increasing the speed capacity of the engine. The proper lead can only be ascertained accurately by using an indicator. Judging by results so obtained, Mr. Quereau states that the correct lead for speeds approximating 250 revolutions per minute, or 51 miles an hour for 68-inch drivers, is not far from $\frac{13}{64}$ inch at one-fourth cut-off for a valve with a ¼-inch Allan port, and ¼ inch for a plain valve. These figures can be used when an indicator cannot.

The tendency on a number of large roads in recent years has been to reduce the amount of lead, some to zero at full gear, and the results have been uniformly satisfactory.

TEMPERATURE EFFECTS ON COPPER ALLOYS.

It is well known that the strength of iron and steel is not affected injuriously by the temperatures accompanying the highest pressures of steam in common use. At a pressure of 200 pounds of steam and a temperature of 388 degrees, there is no diminution in the strength of steel (or iron) boiler plates. This is not true, however, of copper and brass, and it may be well in building locomotives designed to carry very high pressures to give this matter attention, although the experience in the past does not indicate any cause for alarm, as there have been no accidents of note to brass or copper boiler fittings that could be traced to weakness from high temperature. Recent tests have shown that copper having a tensile strength of 50,000 pounds at the normal temperature of the atmosphere was reduced in strength to about 43,000 pounds at 400 degrees, and brass having a tensile strength of 40,000 pounds per square inch was reduced in strength to 14,000 pouuds at 400 degrees. These experiments showed that alloys of zinc and copper are less reduced in strength by temperature changes than alloys of tin and copper. An addition of one per cent. of aluminum to brass is said to render it less susceptible to the weakening influence of high temperature, brass treated in this way having shown 25,000 pounds tensile strength at 480 degrees.

BRITISH RAILROAD RACING.

Two competing railroads run from London to Aberdeen, the "East Coast" route, Great Northern Railway, 527 miles, and the "West Coast" route, London & North Western Railway, 540 miles. The competition of these lines has recently taken the form of trying to excel in the speed of their fastest trains, and races between London and Aberdeen were of daily occurrence between the 1st and 23d of August, on which latter date the struggle ceased and the rival companies agreed to revert to their ordinary schedule time. On the night of Aug. 21 there was some tall running done on both roads. The Great Northern train left London at 8 o'clock and arrived at Aberdeen at 4.40 the next morning, 527 miles in 520 minutes, 60.8 miles an hour. The London & North Western train left London at the same time and reached Aberdeen at 4.55 next morning, 540 miles in 535 minutes, 60.3 miles per hour. The next night the Great Northern beat this record by covering its 527 miles in 512 minutes, 61.76 miles per hour. The train, however, in this case, was composed only of an engine, a guard's van (baggage car) and two passenger coaches.

This is the fastest long distance running on record, but particulars as to the weight of the trains hauled, etc., are not yet at hand. Doubtless the runs were made with exceedingly light trains, as a member of Parliament in objecting, in the House of Commons, to the racing said that only about 35 people were accommodated on each of these trains. The running was done mostly or entirely by simple locomotives.

LOSS OF LIFE AT SEA.

Marine disasters have been so numerous this year and so fatal to large numbers of people that they have quite eclipsed the few railroad disasters that have been fatal to passengers. The year has yet more than a quarter to run, and there have been seven great disasters at sea resulting in the loss of about 1,300 lives. There have been also many disasters on the oceans and inland lakes, the fatalities of which if counted would swell the list to hundreds more. The series of great disasters began Jan. 30, when the German steamer *Elbe* sunk in the North Sea and 378 persons perished. The *Reina Regente*, a Spanish war ship, sunk in the Mediterranean, on an unknown day in March, with all on board, about 420. On May 27, the Pacific mail steamer *Colima*, running between San Francisco and Panama, was wrecked off the Mexican coast, and of the nearly 200 souls aboard but 26 reached the shore. On the day following the sinking of the *Colima* the French steamer *Dom Pedro*, with emigrants going to Brazil, struck a rock off the Spanish coast, burst her boilers and sank, with a loss of 105 lives. On July 18 the British ship *Prince Oscar* collided with an unknown ship off the coast of Brazil, and both ships sunk immediately. The loss of life in this case is unknown. Early in August the Italian steamer *Maria P.* collided with the *Ortigia* in the Gulf of Genoa, and sunk with 148 souls. On Aug. 8, the British steamer *Catterthun* ran on the Seal Rocks, 110 miles north of Sydney, Australia, and sunk, drowning 54 persons.

RELATIVES IN THE DEPARTMENT.

We announced in our last issue that the vice-president of a large railroad company had directed all the heads of departments on that road to discharge or transfer all men in their departments related to themselves, either by blood or marriage. We do not wish to be understood as at this time either approving or opposing such orders, but simply as inviting attention to the fact. It is probable that within the next few years there will be more such orders as this.

The principles involved should receive careful study before conclusions are adopted. There is an old saying that "blood is thicker than water," and it appears that when orders of the above character are issued on a road some officer is more loyal to the spirit of this quotation than he is to the interests of his company or fair in his treatment of his subordinates. When this is the case decided action is necessary, for nothing can exercise a more demoralizing influence on the men affected. Most of us learned to hate partiality in the schoolroom, and when it confronts one in his occupation it makes him antagonistic to the man that subjects him to it, and antagonistic to all he represents.

Consideration of these facts, doubtless, led to the very decided step noted above. It cleared each department of men related to the head of the same in which he was employed. There can be no question but that this was done to discourage favoritism, and to promote justice and fair dealing between officers and subordinates. It is a question, however, if some injustice is not done by such a course. The "relative" may be a very capable person in his particular field of work, and may be enjoying no unearned advantage. An order that either sweeps him from his employment or places him at other employment in which he may have less skill, and for which less adaptability, certainly does him an injustice. But his is an individual case, and it may be argued that the greatest good to the greatest number is the object sought.

But it is deplorable if any worthy object must be attained at the expense of subjecting one individual to injustice. That cannot be right. The method is wrong somewhere. In looking for the defect it may be well to consider if, instead of pursuing such a course, it would not be better to give undivided attention to the officer at fault. If with him "blood is thicker than water," and this influences him to favor a relative, and to give any man serving under him less than his just due in consequence, he should be got rid of, as he lacks the first necessary requisite to the proper handling of men—a correct sense of justice and the fairness to exercise it.

The Star-Spangled Banner is to have a new star, the forty-fifth, and the regulation size is to be changed from six feet by five feet to five feet six inches by four feet four inches. The new star signalizes the Statehood of Utah, which will become a fact next July. The new army flags are to be made of the finest of American silk.

Some of the ex-Southern Pacific strikers are sueing that company for heavy damages in consequence of "false and malicious imprisonment." It is true that many of these men were not justly treated. If they had been they would have been hung for murder and train wrecking. They will get little aid in the courts, and, if possible, less sympathy from the public.

An encouraging sign of the times is the statement of the Pennsylvania Railroad Company for the first seven months of this year, made public Aug. 28. For the lines east and west of Pittsburg, the gross earnings of this period as compared with the same period in 1894, increased $6,506,860.05. The operating expenses increased $4,179,813.32, and the net earnings increased $2,327,046.73.

There is a good deal of evidence indicating that within the next few years a great many carriages propelled by gasoline motors will come into use in this country as well as in Europe, where the adoption of these vehicles is now far in advance of here. It seems that neither electric or steam motive-power stands any chance of successfully competing with the gasoline engine for this service, owing to the greater lightness, cleanliness and general adaptability of the latter. American manufacturers should be interested in this matter. A race of vehicles of this kind is to take place Nov. 2 between Chicago and Milwaukee, and they will compete for a prize of $5,000 offered by the Chicago *Times-Herald*. A similar race for a similar prize offered by a newspaper will soon take place in England. These races will not only stimulate enterprise in perfecting such carriages, but will attract widespread attention to this means of travel.

Literature.

Report of the American Railway Master Mechanics' Association. Edited by the Secretary, 256 Broadway, New York.

This is the report of the proceedings of the twenty-eighth annual convention of the association, which was held at Alexandria Bay, N. Y., in June.

Trade Journals' Review.—This is the name of a new paper published monthly at 72 Market street, Manchester, England. The object of the journal is to direct attention to the chief contents of the technical papers published in England and other countries, and with this in view one of its specialties will be an index of technical literature published in eachi ssue.

A Brave But Useless Act.

The well-known artist, Mr. Thomas Hovenden, was struck and killed by a Pennsylvania Railroad locomotive, Aug. 14, near Norristown, Pa., on what is known as the Trenton Cut-Off of the road named. He was one of a number of trolley car passengers who had disembarked to cross the railroad tracks and take a trolley car on the opposite side. A little girl 10 years old ran on the track in front of an approaching locomotive and became paralyzed with fear on seeing her danger. Mr. Hovenden rushed to her rescue. Both were killed. Mr. Hovenden's best-known painting, "Breaking Home Ties," has been engraved many times, and is a familiar object in thousands of homes in the United States. The painting was one of the most notable of the American group at the World's Fair. Among his other works are "The Image Seller" (exhibited in the Paris Salon of 1876), "Thinking of Somebody" and "News from the Conscript," "Pride of the Old Folks," "In Hoc Signo Vinces," "Elaine," "Last Moments of John Brown."

A street railway in San Francisco draws sea water five miles for condensing purposes, and the warm water is then used in a bathing establishment near the power house.

The *Railway Master Mechanic* relates an instance showing to what extent green lumber is used in car building A lot of cars built two years ago, but not put in service were recently reweighed and were found to have lost about 2,000 pounds each.

The first two steamers which left England for New York were the Sirius and the Great Western. The former, starting from London on April 4, 1838, arrived at New York on the 22d of the same month, while the latter, which left Bristol three days later, arriving on the 23d.

Compressed air is used in the steam heating equipment of passenger trains on the Eastern Railway of France to facilitate the movement of steam in heating long trains, and in getting rid of the water of condensation easily. No modification of heating results are noticeable in consequence of the amount of air used. The apparatus is in use on 562 cars and 229 locomotives.

Perhaps there are but few people who would not like to be something else than what they are. This perverse tendency of human nature is well illustrated by the recent conduct of two wealthy Princeton students who turned tramps in August and "beat" their way in box cars from New York to Cleveland and return, having and spending but $8 on the way. They had fights with trainmen, tramps, and mad dogs, and a "generally delightful time."

The *Scientific American* relates that while conducting a series of tests with a 100-ton testing machine, at the Yorkshire College in England, which included the testing of a steel wire rope, Prof. Goodman stated that such ropes were not a modern invention, and that he had recently seen a bronze wire rope one-half inch in diameter and from 20 to 30 feet long, which had been found buried in the ruins of Pompeii, and which must have been at least 1,900 years old.

And now it has come to pass that the horse driven to grass by the competition of locomotive, electric motor and bicycle, is finding his destiny in conversion into an article of food; so that the horse meat industry of Oregon has already grown important enough to demand and obtain a reduced carload rate on canned meats to Chicago and the East. The patient animal that has long been charged with "eating his head off," is now himself to be eaten, and having been the indispensable pioneer of railway building across the continent, he is now to ride back to the East and on to the old world in tin cans at specially reduced rates.—*The Railway Age.*

Workers in wood will be interested to learn that, in putting together quartered pine or any other kind of wood, greater strength and durability may be obtained by placing the grain of the wood at an angle of 60 degrees than is obtained by crossing at 90 degrees. The reason for this is that, as all wood expands and contracts more or less under the variations of moisture in the atmosphere, the pieces glued at an angle of 60 degrees can expand and contract to a certain extent without tearing themselves apart, as is the case when glued at an angle of 90 degrees. The 60 degrees glue-joint simply pulls the object out of place a little and disturbs its shape, while the 90 degree glue-joint pulls things all to pieces in its effort to accommodate itself to climatic conditions.—*The Lumber World.*

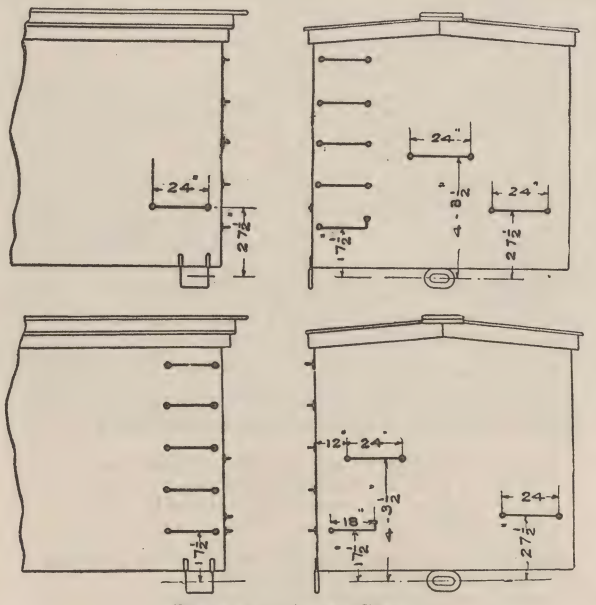
Grabirons and Handholds on Freight Cars.

The Executive Committee of the Master Car Builders' Association met in Buffalo, N. Y., on Aug. 14, 1895, and considered the report of the special committee appointed to take up the matter of grabirons and handholds on freight equipment cars, and advises that the United States law of March 2, 1893, is fully complied with as regards grabirons or handholds if cars are equipped in accordance with the schedule given below:

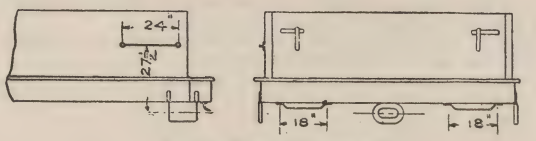
Kind of Car.	Side Handholds.	End Handholds.
1. Box or Stock car with end platforms and end ladders.	One over each step.	Two on each end; ladder may take the place of one.
2. Box or Stock Car with end platforms and side ladders.	One over each step, except where ladder is located.	Two on each end.
3. Box or Stock Car without end platforms but with end ladder.	One over each step.	Two on each end; ladder may take the place of one
4. Box or Stock Car without end platforms but with side ladders.	One over each step, except where ladder is located.	Two on each end.
5. Gondolas with drop ends.	One over each step.	Two on each end.
6. Gondolas with fixed ends.	One over each step.	Two on each end; brake step bracket may take the place of one.
7. Tank Cars.	One over each step; safety railing may take its place.	Two on each end.
8. Flat Cars.	One over each step. If no steps are used, one on each side near end where coupler unlocking rod is located.	Two on each end.

NOTE.—A coupler unlocking rod, if so located that it can be grasped with the hand, may take the place of a handhold.

Referring to the report of the Committee of Eleven, the Executive Committee announces that, giving favorable consideration to recommendations made by the former, it believes that in the future construction of cars the application of handholds should, for the greater protection of trainmen, go somewhat beyond the present "recommended practice" of the association and the requirements of the law, and therefore recommends that the arrangements of handholds shown in the following cuts should be adopted:



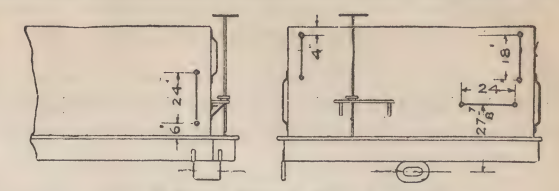
BOX AND STOCK CARS.



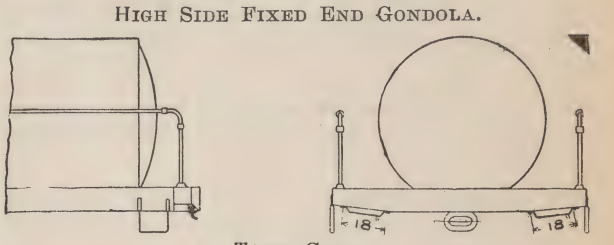
DROP END GONDOLA.

The principal changes from the present "recommended practice" of the association involved would be, first, the addition of one handhold higher up on the end of each car near the middle of the end on cars where a ladder round is not available for such use, for men to hold on to when it is necessary to get upon the endsill or deadwood; second, the location of handholds on gondola cars above the endsill instead of on it, so as to be more like the location on box cars, because of the advantages of the higher location; third, the location of grabirons on endsills of flat or gondola cars beneath the sill.

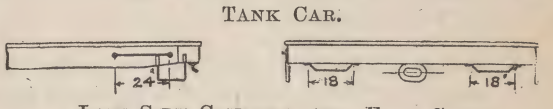
An informal ballot is being taken now on the matter and the result will be announced Sept. 3, and while it will have no steps in the standard or recommended practice of the association, it will show what will probably be adopted at the next convention.



HIGH SIDE FIXED END GONDOLA.



TANK CAR.



LOW SIDE GONDOLA AND FLAT CARS.

NOTE.—All grabirons or handholds should be secured by ⅝-inch through bolts riveted over the nuts, except where it is possible to put a lag screw in the wood; in which case the lag screw must not be less than ½-inch diameter and 3 inches long. It was thought best to show the height of handholds above the center of the drawbar instead of above the under side of the framing as heretofore, because the latter is an indefinite point.

The Illinois Central is about to build new round houses at Canton, Miss., and at New Orleans, La.

Fifty freight cars were destroyed by the burning of the Chesapeake & Ohio shops at Huntington, W. Va., Aug. 8.

It is reported that the Chicago, Burlington & Quincy intends asking Congress to grant it right of way through Yellowstone National Park.

Work on the Government exhibit at Atlanta has reached the installation stage. Not less than 125 models of inventions by women will be shown.

Four locomotives were destroyed by the burning of the shops of the Boston, Revere Beach & Lynn Railroad, near Boston, August 9; loss $50,000.

A fallen brakebeam wrecked a freight train on the Philadelphia, Reading & New England Railroad near Winstead, Conn., August 13, demolishing 11 cars.

The earnings of the Chicago, Milwaukee & St. Paul Railway for the third week of August were $570,408; for the corresponding period last year $549,673; increase, $20,765.

A splendid idea that is being worked out by the General Electric Company is the illumination of Niagara Falls at night by electric lights. It is now stated that two 48-inch lamps, each of 10,000 candle-power, will be used.

The search for petroleum in India has been singularly unprofitable, most of the sources being too small in yield to pay for working, while the richer deposits are, for the present, too far removed from means of transport to be commercially valuable except in Burma.

A German veterinary surgeon has discovered a method by which horseshoes can be successfully manufactured from paper. The paper is impregnated with turpentine to make it waterproof. The inventor claims that a horse wearing these shoes cannot slip on greasy roads.

The Chicago Great Western has received an installment of new sleeping cars, which are to be run on its passenger trains between Chicago, St. Paul and Des Moines. The total number of these cars to be taken is 15, so that each of the limited trains running out of Chicago will carry one compartment and one open sleeper.

A German method is now in operation of manufacturing glass which will transmit light freely but not heat. A thin plate of this material allowed less than 1 per cent. of the heat of gas flames to pass, although transmitting 12 per cent. of the heat from sunlight. Ordinary window glass let some 86 per cent. of the heat through.

The Trenton Iron Works have contracted with the Cataract General Electric Company for an experimental electric line four miles long for towing boats by motor cars on the Erie Canal. Motormen will operate the cars in much the same manner as ordinary electric street cars. This method of applying power is now in operation for logging purposes in North Carolina.

The Boston & Maine Railroad's advance report of its operations for the fiscal year ended with June shows that the gross earnings were larger by $930,036 for the year than for the year 1894. Nearly all of this increase was appropriated to operating, equipment and betterments, and the year ended with the usual dividends paid and a surplus of $72,283, against $19,478 last year. The permanent betterments amounted to $895,147, or 4¼ per cent. on the common stock.

An agreement has been entered into between the Baldwin Locomotive Works, of Philadelphia, and the Westinghouse Electric and Manufacturing Company, of Pittsburgh, by which these concerns will co-operate in the manufacture of electric locomotives, each making those parts of such machines as they are best equipped for. Mr. David L. Barnes has been chosen Consulting Engineer of the combination. The General Electric Company does not contemplate any similar alliance with locomotive works, and in fact does not favor such a combination.

Personal.

Mr. A. A. Campbell has been appointed Master Mechanic of the Texarkana & Fort Smith, with headquarters at Texarkana, Tex.

Mr. W. H. Young has been appointed Ma ster Mechanic of the Florida Southern, with headquarters at Sanford, Fla.

Mr. James Smith has been appointed Master Mechanic of the Gulf, Beaumont & Kansas City, with office at Beaumont, Tex.

The jurisdiction of Mr. J. F. Dunn, Master Mechanic of the Idaho division of the Union Pacific, has been extended over the Salt Lake division.

Mr. D. M. Perrine, Assistant Road Foreman of the Pennsylvania Railroad at Derry, Pa., has been appointed Assistant Master Mechanic at the shops at Altoona, Pa.

Mr. J. M. Carr has been appointed General Foreman of Motive Power and Car Department of the Monterey & Mexican Gulf, with headquarters at Monterey, Mex.

Mr. Alfred Child has been appointed General Foreman of the Como car shops of the Northern Pacific, with jurisdiction over the car shops at St. Paul and Minneapolis.

Mr. Levi W. Morse has been appointed Superintendent of the Grafton & Upton Railroad, with headquarters at Grafton, Mass., to succeed Mr. F. W. Morse, resigned.

Mr. W. B. Page has been appointed Assistant Engineer of Motive Power of the Philadelphia & Erie and the Northern Central lines of the Pennsylvania Railroad.

Capt. Oscar Grant, Acting General Manager of the Wilmington Sea Coast Railroad, has been recently appointed General Manager, succeeding Mr. John H. Daniel, deceased.

Mr. George W. Saul, President of the Ohio Southern, and recently appointed Receiver has resigned and Messrs. McGrew and W. E. Matthews have been appointed Receivers of the road.

Mr. G. M. D. Riley, heretofore Master of Machinery, has been appointed Master Mechanic of the Charleston & Savannah, aud Florida & Western, from Savannnah to Jacksonville, with headquarters at Savannah, Ga.

Mr. W. T. Forsyth, General Manager of the Altoona & Phillipsburg Connecting Railroad, has resigned, and Mr. George M. Case, General Freight and Passenger Agent, has been appointed Superintendent in charge of the road.

Mr. Thomas Saunder, formerly Superintendent of the Colorado Midland, has been appointed General Manager of the Kansas City, Watkins & Gulf, with headquarters at Lake Charles, La., to succeed Mr. F. S. Hammond, resigned.

Mr. E. T. Haines has been elected Vice-President and General Manager of the Jamestown & Lake Erie, with headquarters at Jamestown, N. Y., vice J. F. Workum, Vice-President, and W. E. Griggs, General Manager, resigned.

Mr. James Milligan, Assistant Master Mechanic of the Pennsylvania Railroad at the Altoona, Pa., shops, has been appointed Assistant Engineer of the Philadelphia Wilmington & Baltimore, to succeed Mr. A. Kearney promoted.

Mr. E. E. Jenks, Master Mechanic of the Mississippi division of the Baltimore & Ohio Southwestern, has been transferred to Seymour, Ind., and is succeeded by Mr. C. E. Walker, formerly Master Mechanic of the Toledo, St. Louis & Kansas City.

Mr. E. F. C. Davis, President of the American Society of Mechanical Engineers, and formerly General Manager of the Richmond Locomotive Works, was thrown from his horse and killed, while riding in Central Park, New York, on the afternoon of August 6.

Mr. Charles Dunlap, General Superintendent of the Chicago, Rock Island & Pacific, died at Chicago, Aug. 4, from injuries he had received in an accident on Aug. 1, at the water chutes at Chicago. Mr. Dunlap was formerly Division Superintendent on the Baltimore & Ohio, before going to the Chicago, Rock Island & Pacific in 1886.

Mr. Alexander Kearney has been appointed Assistant Engineer of Motive Power of the United Railroads of New Jersey division of the Pennsylvania Railroad, with headquarters in Jersey City, succeeding Mr. C. M. Mendenhall, promoted, as previously announced, to be Superintendent of Motive Power of the Philadelphia, Wilmington & Baltimore.

Mr. C. F. Lape, formerly Master Mechanic of the Middle division of the Wabash, and later a member of the Illinois Railroad and Warehouse Commission, has resigned from the commision. Mr. Lape is an exceptionally well qualified and efficient mechanical officer, and is an expert on boiler construction. The railroad that secures his services will have in him a valuable officer.

Mr. A. J. Hitt has been appointed General Superintendent of the Chicago, Rock Island & Pacific, succeeding the late Charles Dunlap. Mr. Hitt has been Assistant General Superintendent of the road since 1893. He is succeeded by Mr. W. H. Stillwell, Superintendent of the Iowa division, and is in turn succeeded in this position by his former Assistant, Mr. Harry Fox.

Mr. John C. Barber, Master Car Builder of the Northern Pacific, has resigned and the office is abolished, the duties of the same being assumed by Mr. John Hickey, Superintendent of Motive Power. Mr. Barber is a well-known member of the M. C. B. Associatian, and has long been an industrious worker in its interest. He began railroad work in 1864 on the Chicago & Northwestern, in its Fond du Lac, Wis., shops. From 1874 to 1880 he was Master Car Builder of the M., K. & T., and then, until 1882, Assistant Superintendent of Car Department of the Missouri Pacific. He has occupied the position he has resigned since 1883.

Mr. Edmund Smith died in New York City July 31, in consequence of apoplexy following an attack of grippe sustained early last winter. Mr. Smith was formerly for many years prominently identified with the Pennsylvania Railroad. He was born in Philadelphia April 4, 1829. When 18 years old he was employed as a rodman with the corps of engineers which surveyed, located and supervised the construction of the Pennsylvania Railroad from Huntingdon to the summit of the Allegheny Mountains. He remained in this service until May, 1850, when he was transferred to the Western Division, where he carried on similar work until September, 1852, when he was assigned to Philadelphia to take charge of the erection of shops and the freight and passenger station in that city. In January, 1855, he was elected Secretary of the company, which office he held until May, 1869, when he was chosen Third Vice-President. In March, 1873, he resigned the position of Third Vice-President to accept that of Treasurer. He discharged these duties until September, 1882, when he was elected First Vice-President, succeeding Mr. A. J. Cassatt, resigned. He continued in this second highest office of the company until June 1, 1888, when he tendered his resignation to engage in private enterprises. The Board of Directors ordered a minute to be placed on the records, bearing testimony to his long and faithful service to the company and his devotion to its interests. The vacancy was filled by the promotion of the present incumbent, Mr. Frank Thomson.

The Fire King.

Oh, I am a king, though you make me a slave,
And fret me with warder and grate,
And compel me to live in dungeons that give
No hint of my regal estate!

Though you drive me about with your dampers and draughts
And smother my breath in a flue,
And grudgingly dole me a pittance of coal
As the world I encircle for you;

Though you call me to lighten and warm your abodes,
Your larders with viands to fill,
To wake at the scratch of a lucifer match
By day or by night at your will;

But I bid you beware, though I servilely toil,
I am never the serf that I seem,
For mine is the sun, and the stars, every one,
And the skies, where my thunderbolts gleam.

Oh, who can depict my ecstatic delight,
Or cope with my rollicking play,
As I sweep the broad plain, a forest to gain,
And lick up the towns in my way!

When I waken in wrath from my cave in the earth,
The mountains portentiously quake,
The seas at the sight stagger back in affright,
And the islands stand dazed in their wake!

And man, braggart man, who calls himself lord
Of earth and the measureless main,
At the touch of my breath drops silent in death,
Mere ashes to whiten the plain.

But boast, puny man, of your might while you can,
Your slave will not always obey;
Anon he will rise in revolt to the skies
And the earth shall be melted away;

And the heavens shall roll themselves back like a scroll,
The stars shall like stubble consume,
And firmaments shake with the thunders that wake
When he shall his sceptre resume.

—*J. P. Rand in the Boston Transcript.*

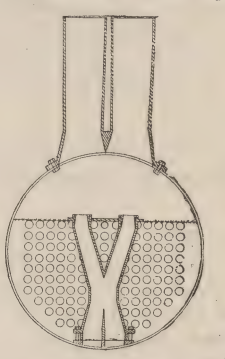
Incandescent Gas Burners.

The greatly extended use of the Auer-Welsbach incandescent burner in the last few years has given rise to competition in the manufacture of the incandescent material, and in the endeavor to make it stronger and more durable.

Carefully conducted tests by Professor W. Wedding, of Berlin, extending over 232 hours, and including the Auer, Trendel, Benas, Sobwasser and Stramme burners, showed that the Auer burner was far superior to the others in economy of gas and in illuminating power. When first lighted this burner showed illuminating power equal to 57.3 candles with 3.81 cubic feet of gas per hour. After burning 232 hours its illuminating power was equal to 38.4 candles, with 3.88 cubic feet of gas per hour. The average performance of the other four burners named was far inferior, burning more gas and giving less than half as much light at the beginning of the tests, and less than one-fifth as much light at the end. Most of these burners are represented as being much more efficient than they were thus proved to be.

A New Form of Smoke Stack.

Mr. W. B. Warren, General Foreman of the shops of the T. P. & W. Railway at Peoria, Ill., has designed a draft arrangement for locomotives which includes the use of



double nozzles and double stacks as shown in the following cut. The intention is to by this means more evenly divide the draft through the flues.

Resistance of Rivets.

M. Dupuy was recently intrusted by the French Ministry of Public Works with the duty of making a special inquiry into the causes of deterioration of metallic structures, and the following is an excerpt of his report appearing in the *Proceedings* of the Institution of Civil Engineers:

A great number of experiments were made, both on rivets and on bars, from which a representative selection is given in the paper. A series of 19 conclusions founded on these experiments is given, 11 of which relate to the behavior of bars under tensile test, and agree with the conclusions of other experimenters on the same subject. Those relating to rivets are as follows:

12. Rivets are bars submitted to tensional stress exceeding the original limit of elasticity. The outside fibers appear to be more strained than those near the center of the rivet.

13. The rivets do not exactly fill the holes but they clamp the plates together with a pressure that gives rise to a resistance to sliding equivalent to a weld.

14. The resistance of the plates to sliding is greater as the limit of elasticity of the material of the rivets is higher.

15. The limit of resistance to sliding is very variable, the causes being numerous and depending on the nature of the material of the rivets, on the temperatures at which the riveting is commenced and finished, and on the method of riveting employed.

16. The resistances to sliding that may in practice be reckoned on, with a joint consisting of not less than three rivets are the following:

Limit of elasticity of metal forming the rivet per square inch.	Method of riveting.	Temperature at which the rivet is closed.	Resistance per square inch of sections of rivet to be sheared.
Tons.			Tons.
11.4 (iron).....	Hand	Bright red heat.,	2 5
14.0 "	"	" " "	3.0
11.4 "	Hydraulic	White heat.....	3.2
14.0 "	"	" "	3.7
14.0 (steel).....	Hand	Bright red heat...	2.85
14.6 "	"	" " "	3.2
14.0 "	Hydraulic	White heat.....	3.8
14.6 "	"	" "	4.2

The hydraulic press used gave a pressure of 38 tons per square inch of rivet-section. In all cases the pressure was maintained till the rivet had cooled to blackness. The riveting cups left no mark on the plates. The material was such as to give an extension of 12 per cent. for iron and 18 per cent. for steel before fracture.

17. This paragraph describes with diagrams the successive steps in the failure of a riveted joint. When there are several rivets to a joint they all yield at once.

18. If yielding has occurred at a joint with deformation of the rivets, the deformation is permanent, but apparently no new effort, which does not exceed that which caused the partial failure, gives rise to further deformation.

19. The effort necessary to shear rivets, per square inch of the sections to be sheared, is not less than three-fourths of the tensile strength of the rivet per square inch.

A Noted Derelict.

Abandoned ships at sea constitute one of the most dreaded perils of navigation. One that has been wandering about and threatening the safety of other ships for about four years has recently disappeared from both the surface of the sea and the pilot charts. She was the Fannie E. Wolston, of New York. Within the space of three years she was sighted and reported 55 times by passing ships. Her useful life ended when she was caught in a storm off Hatteras and buffeted about for two days, when the crew stripped off the sales and rigging, and put for the shore, taking it for granted that the water-logged craft could only float a few hours. Not long after she was drifting composedly about the cape, and the next report stated her to be en route for the Madeira Islands. Merchantmen repeatedly saw her between Bermuda and Liberia, it being her custom to cruise toward Africa, then start for the West Indies, and the return like a desolate maiden to the spot where she was deserted.

An Artistic Illustration of Transportation.

Through the courtesy of the officers of the Pennsylvania Railroad we are enabled to present herewith an engraving illustrating a bas-relief panel recently placed in the Broad Street Station at Philadelphia. It is a beautiful work of art that has been much admired. The design is pertinent and in happy accord with the history of transportation, and the execution is of the highest artistic excellence. This contribution to art is a colossal panel, just finished, and which decorates the wall facing the grand staircase of the waiting room. The conception, as executed by the sculptor, Karl Bitter, is a portrayal of Transportation and its Progress, in harmony with the purpose of the building. The artist has embodied the Spirit or Genius of Transportation in the shape of a female figure, seated on a car, forming a part of a triumphal procession. This figure is in the act of joining or uniting the people of both hemispheres—the East represented by an Arab, old and infirm, together with a sprightly Japanese girl; the West by a youth in Puritan garb, typifying the North, and a woman in Spanish costume, carrying fruit and flowers, for the South. The car or chariot on which the figure representing the Genius of Transportation is seated is drawn by horses, guided by a young girl in the costume of the present time, symbolizing America. In front of the horses, forming the advance of the procession, is a group of children, one of them carrying the model of a locomotive, another the model of the steamboat, while the smallest and youngest child runs ahead with a model of an airship, indicating a future method of transportation. These children are under the watchful guidance of a dignified female figure. Following the North and the South, as represented by the Puritan and the Spanish woman, is a figure on horseback, in Spanish costume, who holds up a model of the "Santa Maria," the first transport that came to this country. Following him, and bringing up the rear of the procession, are the early pioneer and the Indian, together with the emigrants' wagon drawn by oxen and driven by the early settlers. There is being designed a handsome clock which is to surmount the panel.

This is the second costly work of art that this progressive railroad company has had completed within the present year to enhance the beauty of the waiting-room of its great Philadelphia station. The first was a water-color painting of the largest map in the world, covering the entire side of the north wall, and presenting a comprehensive map of the United States, and especially the railroad system of the Pennsylvania Company.

BASE-RELIEF PANEL REPRESENTING TRANSPORTATION, PHILADELPHIA STATION, PENNSYLVANIA RAILROAD.

The South California Motor Road was sold August 10 to the Pacific Improvement Company for $167,100. This road runs from San Bernardino to Riverside, a distance of 12 miles. It is understood that the purchase was made for the Southern Pacific.

A burnt bridge on the Ohio Southern Railroad let an engine and 20 coal cars drop 25 feet into Pain River, near Springfield, O., August 11. The engineer, fireman and head brakeman were buried beneath the wreck.

Master Mechanics' Association Scholarships.

The secretary of this association announces that the examination of candidates for the scholarships of the association will begin at Stevens Institute of Technology, Hoboken, at 9 a. m. September 16.

Any candidate wishing to be examined in Chicago can be accommodated on payment of $10 to cover extra expenses. Those who wish to be examined there will receive directions as to time and place to attend on sending $10 to President Morton, Stevens Institute of Technology, Hoboken, N. J.

Members wishing to enter their sons as candidates will receive certificates of eligibility by applying to the secretary.

Microscopic Writing.

Among the collection of microscopic objects in the United States Army Medical Museum at Washington, says Dr. Henry Morton, in *Cassell's Magazine* for August, is a specimen of microscopic writing on glass, which contains the Lord's Prayer, written in characters so small that the entire 227 letters of that petition are engraved within an area measuring 1-294 × 1-441 inch. So far this statement does not trouble us. If, however, we go a little further we easily find that the area having the above dimensions would be only 1-129,654 square inch, and consequently that an inch square covered with writing of the same size, or counting 227 letters to each such fractions, would contain 29,431,458 letters.

Some one has actually determined the number of letters contained in the entire Old and New Testaments, and finds this to be 3,566,480. Hence the number of letters which a square inch of glass would accommodate, written out like the text of the Lord's Prayer on this strip of glass, is more than eight times this last number, or, in other words, a square inch of glass would accommodate the entire text of the Bible eight times over written out as is the Lord's Prayer on this strip of glass. I am free to confess that though this fact has been known to me since 1873, and I have had in my possession photographs taken with the microscope of this writing, I cannot say that I fully apprehend or mentally grasp the fact just stated. I can form no mental picture of a square inch of glass with the entire text of eight Bibles engraved upon it, and yet, when I have verified the measurements and calculations leading up to this conclusion I feel absolutely certain as to its truth, not as the result of intuition, but as a deduction from experience which has not yet developed into an intuitive consciousness.

Dr. W. Kruse, writing recently in the *Zeitschrift für Hygiene*, on the hygienic utility of light, deals elaborately with physiological investigations of the matter, and in conclusion asserts that light is at once the cheapest and most universal of disinfecting agents—even diffused daylight has its good effects in checking the development of bacteria.

How the Air is Cleansed of Smoke.

Professor Vivian B. Lewes, in the recent article on the combustion of coal, says:

Smoke finds its way from the chimney into the atmosphere, and is rapidly diffused through the air by means of the air currents, and it is manifest that if there were no means of removing it, the air would soon become perfectly opaque from its accumulation in large quantities. When, however, rain falls, it rapidly washes the air free from such suspended solid and liquid impurities, which constitute the visible portion of smoke. Snow is even more efficacious than rain in doing this; where the snow has fallen on the glass of a greenhouse it will be noticed that when it melts it leaves behind a black deposit consisting of the solid matter which it has collected in its passage through the air. An analysis of a deposit of this character formed on glass roofs of some orchid houses at Chelsea gives a very good idea of the constituents of these solid impurities:

	Per cent.
Carbon	39.00
Hydrocarbons	12.30
Organic bases	1.20
Sulphuric acid	4.33
Ammonia	1.37
Metallic iron and magnetic oxide	2 63
Other mineral matter, chiefly silica and ferric oxide	31.24

Water not determined.

In cases where long drought prevents the rapid clearance of the air by this means, the heavier of the solid particles settle by gravity, while the particles of carbon and carbonaceous organic matter are slowly oxidzied, by the oxygen and ozone, into carbon dioxide, in which form vegetation removes them from the air.

It is said that a broken drawbar was the cause of a freight wreck that occurred on the "Big Four" road Aug. 9, near St. Paul, Ind., resulting in the destruction of eight cars, the killing of one man and the injuring of five others.

The report of the Manhattan Railway Company for the quarter ended June 30 last shows: Gross earnings, $2,403,987; operating expenses, $1,399,548; net earnings, $1,004,441; other income, $89,020; gross income, $1,093,462; fixed charges, $713,662; net income, $379,799. The net income for the same quarter last year was $593,303.

The report frequently crops up that the Wagner and Pullman palace car companies will consolidate. It came up again in the latter part of August. Commenting on it, Mr. J. C. Yager, General Superintendent of the Wagner Palace Car Company, said: "There is about as much truth in the report as there is in the report that I am going to commit suicide this evening."

Mr. Charles Margot, in describing the adhesion of aluminum to glass, in the *Archives des Sciences*, Geneva, says that he finds that on heating glass to the melting point of aluminum, the adhesion of the metal is very marked. It is possible to spread the aluminum over the surface of the glass with an iron spatula. It is suggested that this property may be utilized for cementing together the parts of glass apparatus used in laboratories.

A Piston-Head Holder—Some Draw-Bar Strap Bolts.

BY JAMES F. HOBART.

Holding a piston-head while screwing in the rod is some times quite a problem, and before it is solved (in some shops) the head is badly marred and jambed. The excellent device shown by Fig 1 is in use in the D., L. & W shops at Scranton, Pa., and, I believe, originated there Several other railroad shops have holders copied after, or made from the one illustrated.

The tool is built of cast-iron made in one piece, and is bolted to the floor through the holes shown in the plan view. The elevation shows two projections and three indentations; the latter are to receive the piston-head lugs, which, being spaced with radius (six-sided), necessitate the holder being spaced in the same manner, so that one of the head lugs goes into the lower notch, the two adjacent lugs into the remaining two cavities, and the other three lugs go into the semi-circular space above the two round-ended lugs.

The " holder" is a very simple tool, but although made

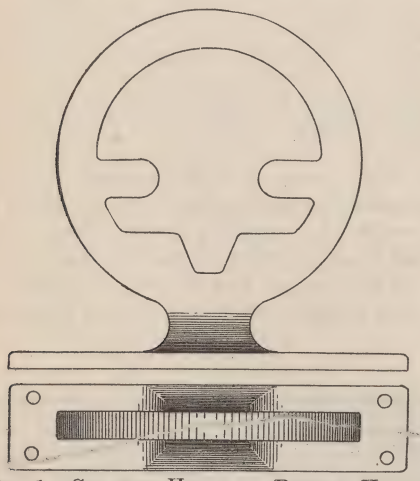


FIG. 1.—GIG FOR HOLDING PISTON HEADS.

for a 20-inch piston head, has been found to work per fectly in holding 14, 16, 18, and even 24-inch heads. This was something not bargained for when the holder was designed, and proves that in railroad shop practice, as well as in architecture, people have sometimes " builded better than they knew."

During a visit to a railroad shop not a thousand miles from Portland, Me., the Master Mechanic expressed surprise (and disgust) at the number of drawbars that came in with their straps pulled off, the bolts being broken or sheared off.

A short time after listening to the remarks by the Master Mechanic, I happened to see a blacksmith iron a drawbar After he had finished the job, the drawbar looked like *A* in Fig. 2. All the boltheads and nuts were set down square, and had the appearance of a first-class job. But appearances are deceitful with drawbars, as with other things. When the strap was put on, only the middle bolt hole came fair, as seen at *B*. Evidently the cores had got knocked out of place. But such a little thing did not discourage the smith in the least. He put in the middle bolt and screwed the nut home solid. Next he looked up a round cold chisel ; the tool was like a punch, only the face was ground off at an angle of 75 or 80 degrees with the axis of the tool. With this implement the first and third holes were cut out, as shown at *C*. Either the draw-bar or the strap, or both, were chipped out so the bolts could be forced through.

A little judicious bending of the bolts enabled them to be

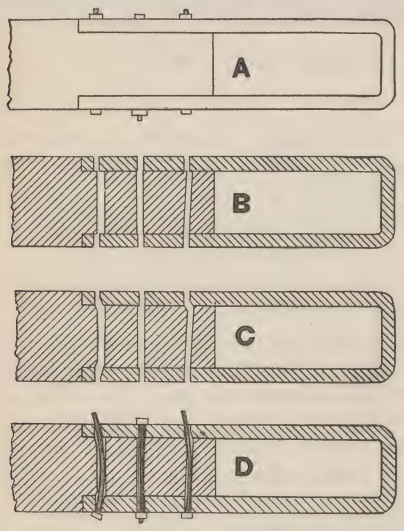


FIG. 2.—SOME DRAWBAR STRAP BOLTING.

driven through, as shown at *D*, without damaging the thread so badly that the nuts would not go on. When nuts Nos. 1 and 3 were screwed up, the bolts took a tendency to straighten, and the effect thereof would be to draw the strap away from the shoulders against the drawbar. From a study of the bolts and their several positions it will be seen that a pull upon the drawbar, as in hauling a train, has a tendency to shear off the middle bolt, as that one is already up to its bearings in the direction of the pull.

After the middle bolt has been sheared off, the third (right-hand) one takes the strain at the bottom end. After three of the six bolt bearings have been sheared, the other three have to stand all the strain and a sudden heavy pull finishes the business for this drawbar. After the bolts were all in place, as shown at *D*, the heads did not bear well, as shown by the first (left-hand) bolt. But this little trouble was very quickly cured. After a strain had been got upon the bolt, by screwing down the nut, a couple of hearty clips from the striker's sledge-hammer very effectually brought the first bolt-head to its bearing—provided it didn't knock the bolt-head off.

It is not to be expected that bolts can hold under the barbarous, unmechanical treatment to which they were subjected as above, and there is no mystery whatever about the failure of drawbars put together in the manner described. A good strong drawbar can only be made up by putting the bolt-holes fair with each other. To this end care is necessary in making the cores of the right size, and in making them enter the core prints accurately when closing the mold.

Revised Chicago Interchange Agreement.

At a meeting of the New Interchange Association held in Chicago, July 30, the interchange agreement existing between the railroads entering Chicago was considered clause by clause and amended so as to practically include the whole car with but few exceptions. The revised agreement goes into effect Sept. 1. We publish it herewith :

We, the undersigned, on behalf of our respective roads, agree to interchange cars, with the understanding that in addition to the provisions of the Master Car Builders' rules of interchange, car owners shall be charged for the repairs of their own cars, with the following exceptions and conditions :

A.—Damage caused by derailment, wreck, train parting, collision, fire or evident carelessness in handling cars shall not be chargeable to owners.

B.—Charges for damage to draft rigging and sills shall be made in accordance with the following, the parts referred to being :

1. Couplers or drawbars.
2. Drawbar springs.
3. Drawbar pockets, spindles or their substitutes and followers.
4. Draw lugs and attachments, carry irons and filling blocks.
5. Draw timbers or their substitutes.
6. Deadwood or buffer.
7. End sills.
8. Longitudinal sills.

Damage to any of the items above numbered 1 to 8 shall not be charged for, if accompanied with simultaneous damage to other items, as follows :

1. If accompanied with damage to either 4, 5 or 6.
2. If accompanied with damage to either 4, 5 or 7.
3. If accompanied with damage to either 5 or 7.
4. If accompanied with damage to either 1, 2 or 7.
5. If accompanied with damage to either 1, 2, 3 or 7.
6. If accompanied with damage to 7.
7. If accompanied with damage to either 1, 2, 3, 4, 5 or 6.
8. If accompanied with damage to 7.

C.—In case of damage to longitudinal sills, bills shall not be rendered if the damage is so extensive as to require the replacement or repairs to more than two sills in a car.

D.—In the case of end or corner posts, bills shall not be rendered if the damage is of such a character as to require the replacement or repairs to more than two end or two corner posts at one end, or more than one end and one corner post at the same end of car.

E.—Any damage caused by cornering or raking cars to be assumed by the company so damaging the car.

It is further understood and agreed:

First. That cars which are the properties of railroad companies party to this agreement, shall be interchanged between the parties hereto without requiring cards for defects for which the owners may be charged.

Second. That in receiving cars from railroad companies, not parties to this agreement, or in interchanging cars not belonging to parties to this agreement, the rules of the Master Car Builders' Association for the interchange of traffic shall prevail.

Third. That nothing in this agreement shall be so construed as to require any of the parties hereto to accept cars which may in their opinion be unsafe to run, or unsuitable for carrying freight, or with defects for repairs of which they are not authorized to bill, unless the party offering the car furnishes a proper M. C. B. defect card.

Fourth. That in case any party to this agreement should be required to furnish M. C. B. defect cards for any of the times covered by this agreement on cars owned by any party to this agreement, and a bill be rendered on such card, the bill and card, or a duplicate of the same, shall be a voucher against the party owning the car for an amount equal to the amount of such bill.

Fifth. Bills rendered under this agreement shall be marked on the face of bill, "New interchange," and shall not include any items rendered under M. C. B. rules.

Sixth. That in case any party shall make repairs under this agreement, such repairs shall be made strictly in accordance with Master Car Builders' rules. Evidence that the repairs have not been so made will be authority for non-payment of bill, or for rendering counter bill in case original bill for repairs has been made. When repairs cannot be made in accordance with M. C. B. rules, the party making the wrong repairs shall card for the same;

Seventh. If cars offered in interchange have missing material (bolts and nuts excepted) the receiving road may require a card covering such missing material, which card shall be a voucher against the railroad furnishing it for the cost of repairs.

Eighth. If M. C. B. couplers, brake beams, brake levers, top and bottom brake rods, air-brake hose are lost or missing on a line, they shall be replaced at the expense of the road handling car when such loss occurred, so far as material is concerned, but the owner may be charged for the labor involved in replacing such material.

Ninth. When repairs are made under this agreement, a repair card shall be securely attached to the car. This card shall specify fully the repairs made, the date and place where made, and name of road making repairs.

The card shall be provided with a stub which will duplicate the information on the card, and stubs must be forwarded to owner of car on the first and fifteenth day of each month.

The repair card shall be 3½ by 8 inches, and the stub 3½ by 4 inches. The cards shall be printed on both sides, and shall be filled out on both sides with ink or indelible pencil, and shall be of the following form:

Tenth. In case any party to this agreement may desire any other party to hold material removed from cars, under this agreement, for inspection, the same shall be held, after notice has been received, for a period not exceeding 30 days subsequent to the date of repairs to such car.

Eleventh. Switching roads—railroads not forming parts of systems, and transfer roads owning less than 500 cars, will not be allowed to render bills under paragraphs B, C and D, and will be held responsible for all new defects which may be caused while cars are in their possession. The same exceptions will be made to the equipment of these lines when it is

NEW INTERCHANGE ASSOCIATION.
Repair Card Stub.

Car No.....Initials.....
Date.....189....
Received following repairs at
.....Shop of the
.....Railway Co.
Name.....
Inspector at.....

When card is applied send this stub at once to head of your department.

NEW INTERCHANGE ASSOCIATION—Repair Card.

Car No.....Initials.....Date.....189....
Recieved following repairs at the..... Shops of the.....Railway Co.

NOTE—Fill in Repairs made on both sides ith ink or indelible pencil. Attach this card securely to the inside cross-tie timber.

.....Inspector at.....

of their own cars, with the following exceptions and conditions :

A.—Damage caused by derailment, wreck, train parting, collision, fire or evident carelessness in handling cars shall not be chargeable to owners.

B.—Charges for damage to draft rigging and sills shall be made in accordance with the following, the parts referred to being :

1. Couplers or drawbars.
2. Drawbar springs.
3. Drawbar pockets, spindles or their substitutes and followers.
4. Draw lugs and attachments, carry irons and filling blocks.
5. Draw timbers or their substitutes.
6. Deadwood or buffer.
7. End sills.
8. Longitudinal sills.

Damage to any of the items above numbered 1 to 8 shall not be charged for, if accompanied with simultaneous damage to other items, as follows :

1. If accompanied with damage to either 4, 5 or 6.
2. If accompanied with damage to either 4, 5 or 7.
3. If accompanied with damage to either 5 or 7.
4. If accompanied with damage to either 1, 2 or 7.
5. If accompanied with damage to either 1, 2, 3 or 7.
6. If accompanied with damage to 7.
7. If accompanied with damage to either 1, 2, 3, 4, 5 or 6.
8. If accompanied with damage to 7.

C.—In case of damage to longitudinal sills, bills shall not be rendered if the damage is so extensive as to require the replacement or repairs to more than two sills in a car.

D.—In the case of end or corner posts, bills shall not be rendered if the damage is of such a character as to require the replacement or repairs to more than two end or two corner posts at one end, or more than one end and one corner post at the same end of car.

E.—Any damage caused by cornering or raking cars to be assumed by the company so damaging the car.

It is further understood and agreed:

First. That cars which are the properties of railroad companies party to this agreement, shall be interchanged between the parties hereto without requiring cards for defects for which the owners may be charged.

Second. That in receiving cars from railroad companies, not parties to this agreement, or in interchanging cars not belonging to parties to this agreement, the rules of the Master Car Builders' Association for the interchange of traffic shall prevail.

Third. That nothing in this agreement shall be so construed as to require any of the parties hereto to accept cars which may in their opinion be unsafe to run, or unsuitable for carrying freight, or with defects for repairs of which they are not authorized to bill, unless the party offering the car furnishes a proper M. C. B. defect card.

Fourth. That in case any party to this agreement should be required to furnish M. C. B. defect cards for any of the times covered by this agreement on cars owned by any party on roads that are not exempt from the provisions of paragraphs B, C and D.

Twelfth. Bills made under this agreement will be outlawed if not received by the car owner in less than six months after date the repairs are made.

Thirteenth. That there be an executive committee of five appointed to whom disputes shall, under this agreement, be referred, their decision to be final and binding ; also to make rules for the transaction of the business of this association.

Fourteenth. Any railroad may become party to this agreement by notifying chairman of executive committee and signing agreement.

Fifteenth. That this agreement may continue indefinitely, and that any party hereto may withdraw from the agreement by giving notice to that effect in writing to chairman of executive committee, said notice to be given at least thirty (30) days prior to the date on which such withdrawal goes into effect.

The following railroad companies have adopted this agreement:

Atchison, Topeka & Santa Fe.
Baltimore & Ohio.
Baltimore & Ohio Southwestern.
Burlington & Missouri River, in Nebraska.
Burlington, Cedar Rapids & Northern.
Chesapeake & Ohio.
Chicago, Burlington & Northern.
Chicago, Burlington & Kansas City.
Chicago, Burlington & Quincy.
Chicago Great Western.
Chicago, Milwaukee & St. Paul.
Chicago, Peoria & St. Louis.
Chicago, Rock Island & Pacific.
Chicago & Eastern Illinois.
Chicago & Northwestern.
Chicago & West Michigan.
Chicago & Western Indiana.
Chicago Belt Line.
Cincinnati, Hamilton & Dayton.
Cincinnati, New Orleans & Texas Pacific.
Cleveland, Cincinnati, Chicago & St. Louis.
Cleveland, Canton & Southern.
Detroit, Lansing & Northern.
Elgin, Joliet & Eastern.
Green Bay, Winona & St. Paul.
Hannibal & St. Joseph.
Illinois Central.
Indiana, Illinois & Iowa.
Kansas City, St. Joseph & Council Bluffs.
Lake Erie & Western.
Lake Shore & Michigan Southern.
Louisville & Nashville.
Louisville, New Albany & Chicago.
Michigan Central.
New York, Chicago & St. Louis.
New York, Lake Erie & Western.
New York, Ontario & Western.
Peoria & Pekin Union.
Pittsburgh & Western.
Pittsburgh, Shenango & Lake Erie.
Pittsburgh, Akron & Western.
Philadelphia, Reading & Northeastern.
Rock Island & Peoria.
St. Louis, Keokuk and Northwestern.
Toledo, Ann Arbor & North Michigan.
Valley.
Wisconsin Central.

Lead for Locomotives.*

BY C. H. QUEREAU.

It is commonly believed that a certain amount of lead is necessary tc furnish a cushion to absorb the inertia of the reciprocating parts as they near the end of the stroke, making them run smoothly. That this is a mistake is evident from the fact, well known to those who have watched the matter when riding a locomotive, that the engine never rides more smoothly than when the throttle is closed, and the only cushion is that due to a slight air pressure and vacuum. This is true of all speeds and cut-offs.

The most important point to be considered in discussing the question of lead is the best adjustment for the cut-off which is used most. It will be assumed that this is one-fourth stroke, and the valve gear is of the Stevenson type.

It requires no argument to prove that the lead for the cut-off may be made so great that steam will enter the cylinder several inches before the piston reaches the end of the stroke; that this adjustment would be very bad, causing the engine to "work against herself," pound and jar, increasing the cost of running repairs, preventing more than moderate speed unless a long cut-off and light throttle were used. It is quite probable that the general practice of throttling was acquired largely because of the general use of excessive lead. That there are locomotives running every day with too much lead in the cut-off is shown by the following extracts from letters written within the last six months by men in charge of locomotives on three of the best known western trunk lines:

(1.) "Engine 25, in passenger service, gave us considerable trouble by loosening her cylinders from the frames and breaking deck bolts. This has entirely stopped since her lead was reduced. Engineers report that she rides much easier and is smarter than ever."

(2.) "The rule on this road, at least on this division, is to give the valves of all engines ⅛ inch positive lead in full gear. Most of them are hard riding and pound themselves to pieces badly; will run about so fast and no faster, regardless of train. I reduced the lead at 6 inches cut-off to $\frac{3}{16}$ inch on one of these engines, and turned her out on the rounds. She did such excellent work that she was the cause of general remark among all the engineers who ran her. Would ride very smoothly, run faster and do her work easier than ever before."

(3.) "These engines, which had $\frac{7}{16}$ inch lead at 6 inches cut-off, were pounding badly, and, even with a light train, had to be worked at 8 inches cut-off with a light throttle. I had the lead reduced to ¼ inch in the same cut-off, and found a very remarkable improvement in their working. We had had a great deal of trouble because of hot main pins, and were unable to overcome this till we reduced the lead. Since that was done the number has been reduced about 80 per cent. To experiment farther I selected an engine which had broken five or six piston rods in 18 months, and found that the valves were set with $\frac{3}{16}$ inch lead in full forward motion, and ¼ inch in full back motion. This was reduced to $\frac{1}{16}$ inch positive lead in full gear forward, and $\frac{3}{32}$ inch negative lead in full back motion. The engine has now run nine months since the lead was reduced without breaking a piston rod; all conditions of service the same. With one of our 18 inch by 24 inch engines, handling our limited scheduled at about 40 miles an hour, including stops, each of three engineers was unable to make running time. Since the full gear lead was changed from $\frac{3}{32}$ inch positive to $\frac{3}{32}$ inch negative they can make up considerable lost time with the same engine."

The reduction of the full gear lead reduced the lead in the running cut-off.

In this connection it is interesting to note the reduction in full gear lead made by the following roads on their passenger engines. Comparing their practice in 1892 and 1893 we find the following reductions: L. S. & M. S., from ⅛ inch to 0; C., B. & Q., from $\frac{1}{16}$ inch to $\frac{1}{32}$ inch; C., R. I. & P., from $\frac{1}{32}$ inch to 0. The following changes have been made in the lead of the P. R. R. Class P engines: In 1886 it was ⅛ inch, in 1890 it was $\frac{1}{16}$ inch and in 1895 it was zero, the valves being set line and line in full forward motion, and with ⅛ inch negative lead in full back gear, giving a reduced mid gear lead of ¼ inch.

Not only may there be too much, but too little lead as well. Inasmuch as the lead at 6-inch cut-off is usually not far from 85 per cent. of the maximum port opening, it is evident that a reduction of the lead means a corresponding reduction of the port opening, and that it may easily be carried too far, reducing the power of the engine. Of the two evils, too small a lead is preferable to too much, because, when engines are at running speed most of their work can generally be done at a cut-off less than one-fourth stroke, and will stand another notch or a wider throttle without impairing their economy; but if the lead is too great the engine must be worked at a cut-off approximating one-third stroke and the steam correspondingly throttled. A wasteful practice.

A Zeuner, or other valve diagram, is very useful in designing valve gears and determining the best proportions of the parts, but it does not tell us whether a given lead is too much or too little. The valve diagram will show that a reduced lead decreases the maximum port opening; delays the points of admission, maximum port opening, exhaust opening and exhaust closure. We must, however, rely on the indicator to learn the exact influence of this change on the steam distribution.

The cards shown in Figs. 1 and 2 were not selected to prove a point, but because the conditions under which they were taken were as nearly alike as possible in service, except the amount of lead. They were all taken from the same locomotive, and with the same valve gear, instrument and operator. The lead for the solid line cards was $\frac{1}{32}$ inches, and for those shown in broken lines a scant $\frac{7}{32}$ inch at 6-inch cut-off. A comparative study of these diagrams is instructive. It shows about the same mean effective pressure for both leads; that the steam line for the smaller lead is but little lower than for the other, in spite of the smaller port opening, and probably because the maximum port opening comes later in the stroke; that the later exhaust closure of the smaller lead reduced the compression perceptibly. The most instructive difference is the effect of delaying the point of admission. Not only does the reduced lead show a considerable gain during compression, but the compression line does not abruptly change at the point of admission, as does in the solid line cards, but brings the reciprocating parts to rest with a uniformly increasing pressure, and carries them over the center with less thump and jar. This is effected not only because the point of admission is delayed, but also because the port opening is smaller as the piston approaches the end of the stroke. This, without doubt, is the reason that a reduction of lead stopped the breakage of piston rods and deck bolts, very largely cured the epidemic of hot crank pins, and allowed the engines to ride smoothly.

It is the opinion of the writer, based on experience and the results of calculations from indicator cards, that a proper adjustment of lead will slightly improve the coal record of a locomotive, because of a somewhat better steam distribution and reduced internal friction, but its chief advantage is a saving in repairs and time lost on the road by engine failures, and the increased capacity of the engine for speed which will follow. The proper lead is the greatest that can be used and secure a full smooth compression line, without a loop at the top, and can be determined accurately only by using an indicator. Judging by results so obtained, it is the writer's opinion that the correct lead for speeds approximating 250 revolutions per minute, or 51 miles an hour for 68-inch drivers, is not far from $\frac{13}{64}$ inch at one-fourth cut-off for a valve with a ⅛-inch Allan port and ¼ inch for a plain valve. These figures can be used when an indicator cannot.

With the Stevenson valve gear the lead increases as the cut-off is shortened, the increase depending mainly on the length of the eccentric blades. The shorter the blades the greater the increase. The blades on a four-wheel

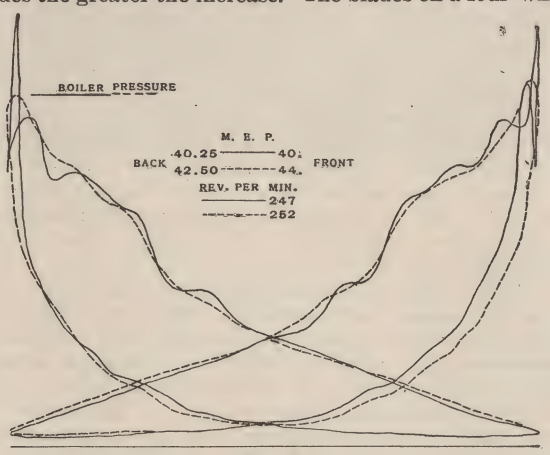


FIG. 1.

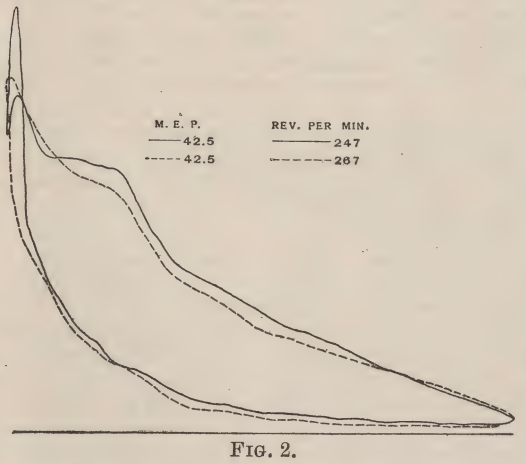


FIG. 2.

connected engine are no longer than those on any other type commonly used, and are not often longer than 60 inches. This length gives an increase in lead of about $\frac{5}{16}$ inch, as the cut-off is shortened from full to mid-gear. Admitting that the lead for the running cut-off should not be greater than ¼ inch, it follows that the lead on most locomotives in the United States should be reduced. In building new engines the valve gear should be so designed as to secure this result, when possible. For engines already in service it may be accomplished by reducing the full gear lead in three ways, making it negative if necessary to secure the desired lead for the running cut-off. First, by reducing the forward and back gear equally. Second, by reducing the back gear lead more than the forward. Third, by reducing the forward gear lead more than the back. If the same lead for 6-inch cut-off be reached by any of these adjustments of the full gear lead, the resulting steam distribution for that cut-off will be the same (see Appendix A), but there will be an important difference in the position of the reverse lever to secure this cut-off. Assume that the lead has been made positive in the usual manner, and the notch in the reverse lever quadrant which gives a 6-inch cut-off is so marked. If the lead is then reduced by the second method, it will be found that the 6-inch notch will give a cut-off of but 4½ inches, and the reverse lever must be moved forward to get a 6-inch cut-off. For this reason enginemen will believe they are using a longer cut-off than before the lead was reduced, unless told the facts in the case. If the lead is reduced by the third plan, it will be found that the 6-inch notch will give a cut-off of about 8 inches, and the reverse lever must be moved to the central position to secure a cut-off of 6 inches. It has been a favorite plan with locomotive runners for a number of years to make their engines "smart" by increasing the lead of the back-up eccentric, believing this was warranted by the fact that their engines had greater power than before when working in the same notch. Had they understood that they were lengthening the cut-off by this change in the lead, and that they were using as much or more steam to do the same work, it is quite probable that this adjustment would not be as popular as it is. Because the steam distribution for the running cut-off will be the same so long as the lead is the same, by whatever method the lead is reduced, that one should be used which will give the best results in full gear.

It is commonly believed that full gear lead is necessary that an engine may be "smart." One engine is smarter than another only when it develops a greater mean effective cylinder pressure or has less internal friction. The difference between the mean effective pressure produced by valves set with ⅛-inch positive and ⅛-inch negative lead will be small when the reverse lever is at full gear and will be somewhat larger for the negative lead because of the longer cut-off it gives. Possitive lead in full gear blocks an engine to the extent that it admits steam to the cylinder before the piston reaches the end of the stroke. A full gear cut-off is used only for slow speeds, and then the valve opens the port so quickly, the port opening is so wide and the piston travels so slowly that there is no difficulty in securing the maximum pressure in the cylinder as soon as needed, even though a negative lead as great as $\frac{3}{32}$ inch is used. This fact acquires additional importance when it is remembered that the piston which is receiving lead is passing the center, where its power is zero, while the other piston is at half stroke, developing its greatest power and doing all the work. No injurious result will follow if full steam pressure is not secured in the cylinder till the piston has passed the center. In view of these facts it seems evident that full gear lead should be negative instead of positive, to secure the best results, and service experiments demonstrate this to be true, notwithstanding the evidence of those who have not tried it.

There is no doubt in the minds of many who have carefully tested the matter that considerable inside clearance can be given the valves of high-speed engines with good results, both as to coal economy and speed. Inside clearance will reduce compression by delaying exhaust closure, and in this way reduce the pressure at the point of admission, or lead opening, but will not affect the form of the compression curve after admission. So that, though inside clearance will reduce compression, it will not remove the results of too much lead. Inside clearance not only delays exhaust closure, but hastens exhaust opening, thus decreasing the distance through which the steam is expanded. The loss because of earlier exhaust opening is small when compared with the gain due to a later exhaust closure at high speeds, but this is reversed in freight service. A locomotive which showed a coal economy of 20 per cent. in fast passenger service because of $\frac{3}{16}$ inch inside clearance on each end of the valve showad as great a loss in freight service for the same reason. A reduction of the mid-gear lead from ⅜ inch to $\frac{7}{32}$ inch not only delays the point of exhaust closure $1\frac{1}{16}$ inches (practically the same results as that produced by $\frac{3}{32}$ inch inside clearance on each end of the valve), but also delays the exhaust opening ¾ inch, a result exactly opposite that of inside clearance, which hastens release. So that a reduction of the mid-gear lead not only reduces the inside clearance necessary, but, contrary to the effect of inside clearance, secures a greater expansion of steam—items of importance in any service. Inside clearance is a benefit only on high-speed engines while a correct lead is of advantage to any locomotive. For these reasons the lead should be properly adjusted before giving inside clearance.

Because of the slow piston speed and wide port opening, a negative lead will give better results than positive when a locomotive is working at full stroke. This is true, because there is abundance of time in which to get full pressure in the cylinder, and the pre-admission of steam acts only to block the piston and lessen the power of the engine. At high speeds and short cut-offs the case is entirely different. Not only is the port opening but a third of that at full gear, but the length of time it is open decreases considerably faster than the speed increases. Taking these facts into consideration, and remembering that the lead is about 85 per cent. of the maximum port opening at 6-inch cut-off, it is apparent that the lead should increase as the cut-off is shortened for increasing speeds.

Conclusions.

There is a large number of locomotives now running which have too great a lead in the running cut-off. In the opinion of the writer, this is true of a majority of locomotives.

A proper reduction of the lead in the running cut-off will decrease the running repairs and time lost because of engine failures, slightly increase the coal economy and increase the speed capacity of most locomotives.

The proper lead for the running cut-off is the greatest that can be used and secure a full, smooth compression line without a loop at the top.

This can be determined only by the use of an indicator.

Positive lead in full gear is of no advantage so far as the working of a locomotive is concerned, but rather a detriment, nor is any power lost by making it negative within reasonable limits.

Lead is not needed on a locomotive for a cushion at any speed or for any cut-off.

Inside clearance cannot remove the bad effects of too much lead, and should not be given till the lead has been properly adjusted.

Lead should increase as the speed increases. Hence freight engines do not need as much lead in the running cut-off as passenger engines.

Appendix.

Table of results from full-sized model. Maximum valve travel, $5\frac{3}{16}$ in.; outside lap, $\frac{7}{8}$ in.

Full gear lead.....	$-\frac{1}{16}$ inch forward motion and back motion.	0 F. M. $-\frac{1}{8}$ inch B. M.	$-\frac{1}{8}$ inch F. M. $+\frac{1}{16}$ inch B. M.
Cut off.....	6 inch.	6 inch.	6 inch.
Lead for cut-off.....	¼ "	¼ "	¼ "
Valve travel.....	$2\frac{11}{32}$ "	$2\frac{11}{32}$ "	$2\frac{11}{32}$ "
Maximum port opening.....	$\frac{19}{64}$ "	$\frac{19}{64}$ "	$\frac{19}{64}$ "
Occurs in stroke at..	$\frac{11}{32}$ "	$\frac{5}{16}$ "	$\frac{5}{32}$ "
Exhaust opens at....	$16\frac{1}{16}$ "	$15\frac{13}{16}$ "	$15\frac{3}{4}$ "
Exhaust opening, maximum.....	$1\frac{5}{32}$ "	$1\frac{5}{32}$ "	$1\frac{5}{32}$ "
Exhaust closes at....	$16\frac{1}{16}$ "	$15\frac{13}{16}$ "	$15\frac{13}{16}$ "
Lead opens at.....	$23\frac{3}{16}$ "	23 "	$23\frac{1}{32}$ "

The above gives the steam distribution obtained by reducing the lead in the running cut-off by the first, second and third methods. It is evident that this will be the same for the 6-inch cut-off so long as the lead for that cut-off is the same, no matter by which method the full gear lead was reduced.

* From the *Railroad Gazette*, Aug. 9.

The Forger's Art.

The art of forging iron and steel into shape attained to its highest degree of perfection during the Middle Ages, says the *Iron Age*. The works of the mediæval swordsmith, locksmith and armorer are used as models to-day. We must admire this high degree of perfection all the more since the mediæval smith did not possess any of the numerous mechanical appliances of to-day. As early as the thirteenth century iron plays an important part in architecture and building. Not only as structural material, but for ornamentation, iron was used in ever increasing quantities.

But while the works of peace offered a wide field of usefulness for the skillful smith, there was also a great demand for all the paraphernalia of war. The sword was the principal weapon, and was consequently valued very highly. Its services were extolled in song, and its quality received the keenest attention. A good sword was baptized and given a a name and its maker ranked high in the social scale and popular esteem. To obtain the necessary hardness, elasticity and ductility desirable in a good sword, iron and steel was welded together; one strip of iron between two strips of steel. The bar thus obtained was forged out to twice its length, cut in the middle and the two bars welded again and forged to two-thirds the length of the intended sword. The tang was then welded on by doubling a piece of iron and clamping the ends on to the steel bar, thus welding this double-up strip of iron into a solid piece at the same time that it was welded on the steel bar. The bar was then forged into sword shape with great care with frequent reheating. Sword making was carried on on a large scale under a factory system, and the division of labor was carried out very extensively in the details of manufacture. The forgerers, temperers, grinders, hilt and scabbard makers formed separate guilds in Solingen, in Germany. The sword forgers, temperers and grinders preserved their respective trade secrets with the greatest jealousy, and the members of their guilds were bound by solemn oath not to leave the country and not to impart the secrets of their respective trades to any but their own sons, or, if they had no sons, to their nearest relatives, Progress in the manufacture of swords was only in the direction of variety of form, but not in quality. When we remember how Greek historians speak of the excellent Spanish swords as something as a matter of course, and the enthusiastic praise of King Trasamundus of the Damascus swords, and read the songs of the ancient Germans extolling the qualities of the swords of their heroes, having them baptised by the priest and given endearing names, it is evident that there was but little chance left for improvement in quality. Hence, in the Middle Ages, the ingenuity of the swordsmith expended itself in variation of form and ornamentation.

After the conquest of Spain by the Romans the clumsy and heavy sword of the Roman army was changed for the lighter Spanish sword. The difficulties which Rome encountered in conquering Spain were chiefly due to the superior arms of the Spaniards. Their two-edged swords were formidable weapons, and they carried also a daggar which was used in hand-to-hand fighting. Their spears were all iron, with barbs near the point. Diodorus describes the manner of producing the excellent iron for the Spanish swords thus: "They bury iron plates in the ground and let them lie there until the rust has eaten away the softer parts and only the strongest portion remains. From this portion their swords and other armament are then wrought. A weapon thus made cuts everything that comes in its way."

At first sight this reads like a fable. Considering, however, the conditions then prevailing such a method looks not only plausible, but becomes almost a matter of fact, since excellent swords are made in Japan to-day in the same way. A further confirmation we have in the fact that the peasants along the Rhine prize occasional finds of Roman arms or other products of iron of that distant day very highly, since they can be wrought into very good, keen edged cutting tools. A hatchet or other tool made of such an ancient piece of badly rusted iron was better than one bought in a store. The explanation is simple. Steel does not rust as quickly as wrought iron, especially if the latter is full of impurities. Since the method of making iron was very imperfect in ancient times, the product was usually a mixture of steely and of soft iron. In forgings the character of this mixture of high and low carbonized iron was not changed, and the subsequent rusting in the ground ate away the soft parts first, while the steely part remained.

The exquisite skill displayed by the metal workers of the Middle Ages is noteworthy, particularly so when we consider the absence of mechanical means and often primitive methods. Slow progress was made in the improvement of tools and machinery.

In the tenth century progress is perceptible in the treatment and use of steel. Armor is highly polished and mention is made of means for surface hardening (carbonizing) of wrought iron. The juice of radishes and angle worms is recommended by Albertus Magnus as a means for hardening steel. Not until the fourteenth century was wire drawn by means of mechanical appliances and water-power. In ancient times wire was made by forging it on the anvil. Very thin wire was cut from sheet metal and then rounded. The wire smith was then as much a specialist as the nail, sword, lock, spur and horseshoe smith. After the invention of the draw plate, wire was drawn by hand. The workman pointed a bar to be drawn and with a pair of tongs grasped the pointed end, which he had stuck through a suitable hole in the draw-plate. He sat on a swing, braced his feet against the draw-plate, and, pushing himself back, pulled the wire through for 10 or 12 inches. The tongues were hooked to a belt around the man's chest to assist his pull by the weight of his body. The finest and best draw plates were made in Lyons, France. In the fourteenth century the water-wheel came into use and machinery began to supersede the primitive hand labor for wire drawing.

Cussing on a Salary.

Cussing is by no means a lost art. It once flourished in a crude and rough fashion in the army in Flanders, where soldiers that had boots left them in the mud, and considerable carving was done with military cutlery on dark nights and in thick fogs. Cussing under such circumstances, if not justifiable on moral grounds, was found to be of special pushing power in the butcher's business. As a man-propelling motor it was freely patronized on board ship when the sea-dogs of Drake, Nelson and Paul Jones had to look into a sixty pounder to stop a ball and climb over a wall of pikes with a cutlass in their teeth. It is also of considerable potency nowadays when seamen fail to hold on with their eyelids in a ship's rigging, or to make a knot in a frozen ratline. In digging canals and sewers, where a man is disposed to straighten his back and give his shovel an occasional vacation; in driving piles for a railway bridge or spikes in railway ties; when a man wants to sneeze, or objects to his eyes being inundated with perspiration; in complimenting mules when they stand on two legs, and refuse to dislocate their spines or break their harness in pulling a wagon out of a quagmire. In all these crises and emergencies, the art of cussing takes the red ribbon at the fair. Its immediate results are those of a shawl pin applied to a tender spot, or a gas explosion on a hotel window. The slow worker quickens his pace. If in danger of taking a nap when standing in his shoes, a wasp on his collar could not wake him sooner. If his mind or his body are out of order from having to pay a ten dollar bill at the grocer s with a solitary five and a lonely quarter, or from a bad cold and a disabled stomach, he is brightened up and made a boy again with the usual dose of sulphur found in all good able-bodied cussing. Now, it is by no means strange that so potent a force should be overlooked, or its money-value be unrecognized. In many public works and institutions, or railway construction and in busy hustling mills, cussing abilities command a salary. When in connection with a copper-lined pair of lungs and a nature that would not disgrace a keg of nails, and a gift of turning on the power when the car is slowing up, the art of cussing in an industrial sense is seldom at a discount.

It is a case, however, of making a big mistake, in handling men as we manage mules or drive piles. As a rule a man will do his best for the man who treats him best, and in any circumstances and with any type of man one need not be a bully to secure good and faithful work. There are men by the thousands who are day by day subjected to the poisonous and pernicious influence of the salaried cusser. The sandpaper is rubbed on their skins, and all sense of dignity and self-respect in their daily working life is squeezed out of their souls. Think you that this thistle seed dropped into men's lives will not grow thorns? Is labor made honorable and contentment possible under such conditions? We trow not. Stroking the fur the wrong way makes a scratching cat of a kitten. Butt a goat and he will return the compliment. Treat a man as a mule and he will have the same propensities. You cannot drop a dead dog in your neighbor's well without spoiling your own tea. We believe, and we are not without a good reason for our faith, that there would be less friction between labor and capital if there was less of the man-propeller and his tin horn in our industrial establishments. We are aware that men are to be found everywhere who require more than a gentle hint to keep them in line, and who, if left to themselves, would do nothing else but draw their pay. In such cases a little salt is necessary to keep off the flies, but as a general thing and as a rule it is a grave mistake to suppose that cussing on a salary makes better men or better work. —*Fred Woodrow, in the Age of Steel.*

The Alpine Pass.

A Denver correspondent of the New York *Sun* writes as follows:

The highest railway pass in North America is about to be reopened for traffic. This is the Alpine Pass route of the South Park line to Gunnison and Pitkin, which was closed about seven years ago because of the expense and extreme difficulty of keeping the route open in winter.

Alpine Pass crosses the main range of the Rocky Mountains near the base of Mount Princeton, one of the college group of peaks which lift their snowy summits above the range about midway between Mount Massive and Mount Ouray. In the beginning of the Gunnison district mining excitement which followed close upon the Leadville boom, two routes were located over the crest of the continent, one called Marshall Pass, at the base of Mount Ouray, and the other Alpine Pass. Otto Mears established a toll road over Marshall Pass, which was soon after followed by the Denver and Rio Grande surveyors, and the other steeper and more rugged pass was used by the prospectors who had no money to squander in tolls. The Alpine Pass was the shorter route from Leadville, and the eager prospectors generally took the shorter way, for time was precious in those days. In Alpine Pass dangers seemed to lurk at every step; the snow hung on until June was almost spent, slides were of almost daily occurrence, and nobody had time to do any repairing on the trail. Often teams met at narrow ledges, where a hand-to-hand encounter settled the right of way and the weaker party was apt to tumble down a precipice.

The year 1880 witnessed the race to Leadville of the South Park and the Rio Grande. Owing to the war for the possession of the Royal Gorge on the Arkansas between the Atchison and the Rio Grande companies, the South Park secured the immense traffic of the early Leadville rush, which made its earnings phenomenal. It was easy to secure capital to build the Alpine Pass road under such conditions, and a survey was rapidly made. There was no time to choose the most practical route and the easiest grades. The promised business seemed sufficient to pay a handsome revenue, no matter what the cost of operation, and the promoters wanted the line completed without loss of time. In June, 1880, a tunnel was begun, which was finished by September, 1881, and soon after the South Park trains were climbing into the clouds to an altitude of 11,600 feet.

The survey followed Chalk Creek from the Arkansas River until the cañon walls shut in the foaming torrent. Then the ascent was made in a winding course at a maximum grade of 211 feet to the mile, around projections of rock, zigzagging back and forth, in and out, until near the summit of the pass a tunnel 1,780 feet long was located through the crest to the western slope. There the mountain sloped downward in a still more dangerous and abrupt manner. A shelf of granite was blasted for a great distance, and over one particularly steep slope a granite parapet was constructed whereupon to hang the rails of the narrow-gage track. The dangers encountered in constructing the road were many and various. Fifteen men lost their lives by accident and many more from exposure. More than one burro laden with dynamite toppled over a precipice and instantly disappeared from mortal vision in a tremendous explosion.

Down below, track construction was hastened as rapidly as men and supplies could be brought into the district. The town of Hancock, below the tunnel, became one of the most bustling cities of the State. It was named in honor of General Hancock. Near by were gold mines now forgotten. Closer to the tunnel were the Hortense Hot Springs, the Hortense Hotel, the Hortense mine and the town of Hortense. Believing that Hortense would become one day a famous health resort, a company of speculators in Quincy, Ill., bought up the springs and proceeded to construct a summer resort. It was built in Chalk Creek Cañon, some distance from the track, and finished in elaborate style. Hot and cold baths were placed on every floor, and electric bells were introduced. By the time it was completed business had died away, the town of Hancock was reduced to a water tank and a section house, the mines were deserted, and to add to the demoralization, the tunnel route was abandoned. The hotel remains in solitary grandeur amid the snowbanks and pine trees without having entertained a single guest. Who now owns it no one seems to know. The railway officials speak of it as the "Lost" Hotel. To-day, between Nathrop station, on the Arkansas, and Gunnison not a habitation remains save an occasional ranch nestling in a cañon beside a stream. The whole district, which 15 years ago was thickly populated with prospectors, is now forsaken. Everything was abandoned when the South Park trains ceased to climb over the range. The winters intervening have played havoc with the roadbed. Slides of snow and rock tore out the track in many places, and the tunnel itself was filled to the roof with blue ice formed from the dripping waters within.

To reopen this tunnel has been a dangerous business, and, as in the days of its construction, lives have been sacrified in the work. A construction gang worked in the tunnel recently from the western entrance until they had cleared the tunnel of obstructions to the center and part way down on the eastern slope. Entering later, and working forward, the locomotive came upon a body of water banked up by debris ahead. Some of the workmen began to feel the effects of the gas from the locomotive, and started up the grade to reach the fresh air near the western entrance. As they moved back one man was overcome by the fumes, and his companions lifted him with the intention of carrying him to a place of safety. Suddenly the locomotive was upon them, hastening backward. With a shout the men on the track warned the engineer, who reversed quickly. This seems to have been his last act, for the locomotive plunged forward down the heavy grade, and dashed into the water and rock slide ahead. The workmen on the track reached the summit in the tunnel in safety, and were soon in fresh air, but those on the locomotive were suffocated. It was not until the following day that the smoke and gas floated and permitted the men to reach the locomotive. Four men were found dead on the engine—the engineer, the fireman, the conductor and a laborer.

The grandeur of the scenery along the route is beyond description. On the western slope just below the tunnel the train follows a ledge cut out of the mountain wall, from which miles of mountain summits can be traced far below, with intervening cañons, gorges and parks. Below the narrow ledge the slopes drop away almost perpendicularly down, down, down, thousands of feet, while above the granite cliffs tower into the snow line.

A novel feature which it is stated has lately been introduced on trolley parties on the Old York road line has done much to increase the popularity of the excursions on that particular line. A few nights ago, as one of the gayly decorated trolley cars was speeding out the road, the stentorian voice of the conductor rang out above the chatter and laughter of the merry-making. "Three minutes in a tunnel," the conductor sang out, and, although there are no tunnels on the road, the conductor gave a very good imitation of one by pulling down the trolley-pole and leaving the car to run down one of the long hills in utter darkness. It only took about 10 seconds for the young men in the party to size up the situation, and it is said that for the next few minutes there were so many unmistakable sounds of kissing that the chaperons of the party were moved to call upon the motorman to put on full speed and "get out of the tunnel." Just at this minute the car arrived at the foot of the hill, and the conductor replaced the trolley-pole. The sudden reappearance of the lights disclosed two or three "hugging bees" in progress on every seat, which apparently justified the suspicions entertained by the chaperons. However, since the story has gotten out, the trolley company has been besieged by applications from excursion parties anxious to go over the "tunnel" route.—*Philadelphia Record.*

A California Electric Railway.

The following engravings show the arrangement of cars and motor used on the Oakland, San Leandro & Haywards electric railway in California. Incidentally they also show the pictures of a number of Californians. One cut shows the method of loading freight or express matter. Packages are gathered by the wagons in San Francisco, taken across the bay to Oakland, and there wagons and all are loaded on flat cars with a skid block and tackle. As the various wagons reach their destination—the country villages—they are run to the ground, meet their horses and the express matter is delivered rapidly. The locomotive is equipped with two 50-horse power motors and weighted down with three tons of railroad iron.

Handling Express Matter.

A Remarkable Trolley Line.

Among all the new railways made possible by the use of the trolley none is quite so wonderful as that now building close to the water's edge along the American bank of the Niagara gorge. Here the electric current is about to make travel possible and easy between points never before covered by man's footsteps. This road, now in course of construction, is expected to be open for travel early in August for a portion of the distance it covers. Now the roar of the dynamite blast echoes and re-echoes between the rocky cliffs as the roadbed is dug out along the debris slope. Bowlders which for centuries have remained undisturbed have been blown to pieces to make way for the trolley's march, and trees of the beautiful bank have also unfortunately fallen victims of man's invasion.

This has been done in order that curious humanity may the better view Niagara at its wildest and best scenic points as it rapidly flows between the high cliffs toward Lake Ontario. When the road is first operated its upper end will be at the Buttery elevator, where the whirlpool rapids toss highest. Its lower end will be on the dock in Lewiston.

The roadbed is about twenty feet up from the water's edge, and wide enough to accommodate a double track. The center pole system will be used. The rails will be of extra heavy weight, and the line will be rock ballasted from end to end.

Starting where the waters of the rapids run wildest, the sightseers will be carried along in full view of the rapids, and past the whirlpool, across the broad and dangerous expanse of which they will have the best view ever afforded visitors to the Falls. They will pass through portions of the gorge where for centuries the caw of the crow and the occasional flight of the eagle have been undisturbed. The thickly wooded banks of the gorge will have added attractiveness from the delightful point of view, and at the Lewiston end of the road they will look upon peaceful waters which form a marked contract with the fury displayed at the starting point.—*Harpers' Weekly.*

A Sailor's Ride on a Bicycle

An old sea captain who made his last prosperous whaling voyage 25 years ago and has since spent his summers at Nantucket, recently described to his old comrades at the 'Sconset Club his experience, according to the New York *Tribune*, in learning to manage the new craft. It had been rumored on the island that he had been learning to ride a bicycle. That subject was broached soon after the "Cap'n" entered.

"Yes," said Cap'n Peleg, "I did try to learn to sail that new craft. I didn't want to do it, but my granddaughter, Phœbe Ann, shipped me for a cruise, and said she'd teach me how to navigate it."

"But how can the girl sail one with a woman's rig on?" asked Cap'n Zacheus Pitman, who hadn't been off the island for more than 20 years. "Doesn't she get her lower riggin' in a snarl round her legs?"

"Mebbe she would if she wore petticoats," said Captain Peleg. "She's got beyond that. You see a bicycle is a very funny craft. Everything is stowed above the water line, and cap'n, crew and passenger—and these three are one—are way up 'loft. So she's topheavy at the start. On such a craft a woman wants to spread mighty little canvas; and as for tophamper, it needs to be light—just enough of it to let other craft know that it's a woman in command. A bicycle hasn't got any centerboard to keep her from driftin' to le'ward, and she doesn't carry any ballast. So, if a girl has got a big lot of canvas spread over her lower spars, she may heel over to le'ward when working against the wind, and mebbe capsize, unless she brings her bows to wind. Phœbe Ann saw that she was hampered by the canvas she carried. She had taken reefs in her skirts, but even then she couldn't board and land as she wanted. She saw that many girls had bent their courses altogether and put on a closer rig. So she said she'd do it, too. She put on a new kind of breeches—a little baggy above the knees—which she lashed 'round her stern plankin'. I tell you she looked trim in it, though the rig was a good many pi'nts off course, as women carry sail nowadays. But now, when Phœbe Ann jumps aboard a bicycle, she can run before the wind, sail closehauled, beat to wind'ard, or go safe with a heavy wind on her beam and not show her keel, though there isn't a pound of metal stowed around her kelson.

"I didn't tackle kindly to the thing at first. Seamanship don't help a man sixpence worth in sailing that kind o' vessel. But Phœbe Ann told me I'd got to learn. She wouldn't take no for an answer; so I headed for the park, in convoy of the girl. I found she had chartered a wheel for me. There it was, moored longside the place of the man that owned it. How I was to get aboard I didn't know. There was no ballast to keep her steady. There wasn't a deck to land on or a cockpit into which I could jump. There was a thort about as big as a duffplate made of leather lashed over a little iron frame. I was expected to straddle it, and squat down with one leg hanging over the port rail and the other over the starboard. Phœbe Ann offered to steady me when I was gettin' aboard, but I told her I was too old a sailor to need a woman's help to get on a small craft like that, and I would do it alone if I sunk.'

"How did you succeed?" asked Cap'n Melchisidek Starbuck.

"I tried it alone. I put one foot on the port outrigger, but as there was nothing below the water line to keep the thing on an even keel, my weight pulled the thing over onto me, and first I knew I was tryin' to get out from under the wreckage. Well, the girl laughed in a most provokin way. I didn't say anything about that, but I told her when we got the durned thing afloat again, I'd let her help me aboard. She held up the wheel until I straddled the thort. Then I realized that I was in command of the awk'ardest craft that I had ever been aboard of. What bothered me was that the steerin' gear was for'ard instead of aft, and the rudder was rigged under the bowsprit. Then there was a two-pronged tiller which it took both hands to work. I would as soon think of putting the galley on the main top as to change things around as they do in buildin' wheels.

Train on Oakland San Leandro & Haywards Electric Railway.

The Missouri Construction Co., St. Louis, has been incorporated to construct railroads, bridges, etc. The capital stock of the company is $100,000. The stockholders are: O. W. Hester, A. O. Cooper, L. W. Harper, C. A. Cunningham and Scuder Hinde.

The Largest Painting.

An artist named John Banvard, who died at Watertown, S. D., in the summer of 1891, according to the St. Louis *Republic*, painted the most remarkable panoramic view ever attempted. It was a 2,000-mile view of the scenery along the Mississippi River, and was painted on a strip of canvas 22 feet wide and nearly two miles long.

The Largest Lens.

The largest lens ever constructed recently received the finishing touches at the establishment of Alvah G. Clark & Sons, Cambridge, Mass. It is intended for the observatory on the shores of Lake Geneva, Wis., which is being built as a gift for the Chicago University, and which is to be known as the Yerkes Observatory. The lens is 41½ inches in diameter and weighs 500 pounds. The exposed surface or aperture of the lens will be 40 inches, the other inch and a half being taken up by the casing. This makes it four inches larger than that of the Lick telescope in California, which heretofore has held the place of honor. It consists of two seperate lenses of different density and shape, separated by a space of several inches. The outer of these lenses, that is, the one nearest the end of the telescope, and which comes in contact with the atmosphere, is made from a perfect piece of crown glass. It is double convex, and weighs 200 pounds. The inner lens is made of flint glass, is plano-concave and weighs about 300 pounds.

The King Car Co. of Scranton, Pa., has been incorporated with a capital stock of $100,000. The directors are: S. D. King, George B. Smith, Charles S. Farrer, Dunmore, Pa.; Clarence D. Simpson and Thomas H. Watkins, of Scranton, Pa. The company will manufacture railroad cars, trucks and other parts of cars.

The editor of a newspaper that has adopted phonetic spelling in a measure, received a postal card from an old subscriber in the country which read as follows: "I hev tuk your paper for leven years, but if you kant spell enny better than you have been doin' for the las' to months, you may jest stoppit."

"It seems strange that every passenger on board the train which was wrecked should have perished in the burning cars." "Well, you see, the majority of them escaped in the first place and were congregated beside the track, attending the wounded or watching the flames, when Jawsmith, the life insurance agent, mounted a convenient boulder and announced that he would occupy the time till the arrival of the relief train by making a few appropriate and timely remarks on the subject of life insurance. Thereupon the whole company cried out in a loud voice and rushed back into the blazing wreck, mercifully carrying the wounded with them. "And Jawsmith?" "Oh, he rushed in after them to finish his remarks."

First Horse—Well, they took poor old Dobbin to the slaughter house to-day. Second Horse—That's too bad. First Horse—It is bad, but worse remains. They mean to make his hide into bicycle saddles.

"The reason Oireland is such a distressful counthry's because of the absentee landlords."

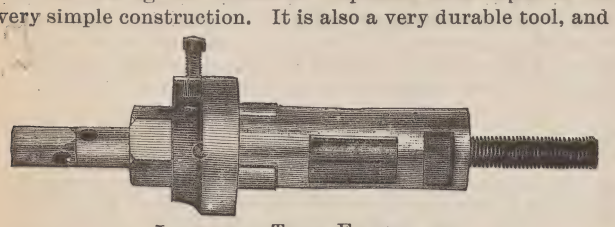
"Ah, be gorra! you're right; and the counthry's overrun with 'em."

Boron steel, in which the carbon is largely replaced by boron, was recently tested for its mechanical properties. A five-pound ingot was rolled into a bar, and was easily worked at a dull red heat, but crumbled under the hammer when made too hot. Bars tempered at different temperatures and compared with bars of carbon steel containing respectively .07 per cent. and .37 per cent. of carbon, tempered in the same way, were found to have substantially the breaking strength of the harder steel. The boron steel however, remains soft to the file, even the strongest specimens being filed easily, while the file could not touch the hard tempered carbon steel.

"A dollar looks as big as a Mexican cart wheel to me nowadays." "Yes, and it's just about as hard to make go round."

The National Tube Expander.

The following cut shows an improved tube expander of very simple construction. It is also a very durable tool, and



IMPROVED TUBE EXPANDER.

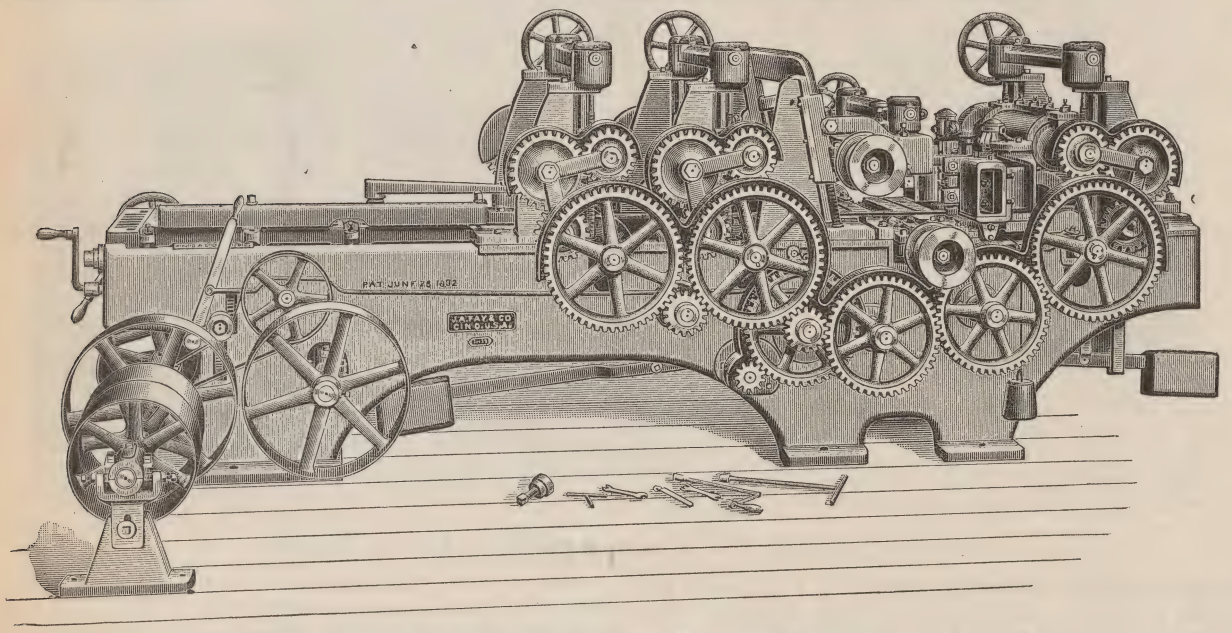
in practice gives a gradual expansion. It has a cutter attached which is very efficient and satisfactory in its operation. It is made by the National Tube Expander Company, of Ypsilanti, Mich.

Double Cylinder Planing and Matching Machine.

The machine shown in the accompanying illustration is the largest and heaviest planing and matching machine made by Messrs. J. A. Fay & Co., of 515-35 West Front street, Cincinnati O., with special reference to durability, convenience, rapidity and the general requirements necessary to economy of labor and the superior quality of its productions. The machine is made in three sizes to plane two sides up to 24 inches, 28 inches and 30 inches wide and 10 inches thick, and match or joint material up to 18 inches, 22 inches and 24 inches wide, respectively. The framing is massive and perfectly fitted and bolted together to secure the requisite solidity. The journals, shafts, gears, screws and bolts are made to standard sizes, which, with a system of interchangable parts, enables duplicate parts to be supplied on short notice.

The cylinders are made from solid forged steel and are slotted on all four sides. The journals are $2\frac{7}{8}$ inches in diameter and are lead ground. The bearings are exceptionally long and, after being lined with the best material procurable, are scraped to a perfect fit. The upper cylinder has its bearings yoked together from above, and planed to fit cored uprights cast to a solid bed plate, and bedded in a groove which retains them in line. These yoked bearings carry the pressure bar over the lower cylinder which, while also having an independent adjustment, rises and falls with them. This pressure bar after being set to suit the cut of the lower cylinder requires no other adjustment for any variation in the thickness of the cut, an important item in a machine provided with a power-raising attachment. The lower cylinder runs in a heavy frame, adjustable to suit the cut, and has pressure bars on each side of it.

The power-raising attachment is so arranged that the upper cylinder and feed rolls can be raised or lowered together or that they may be instantly thrown out of gear and any desired adjustment made by hand. When the upright lever shown is thrown forward it unlocks the upper cylinder, and tightens the belt operating the raising attachment, and another lever on the end girt, convenient to the operator, throws the friction in and out, and raises or lowers the cylinder and rolls as the lever is thrown one way or the other. A gage is placed on top of the side frame in a position to be easily read by the operator. Suitable stops are provided to prevent accidents arising from the cylinder and rolls traveling beyond a safe point. Ball bearings are placed under the upper cylinder screws rendering them easy of adjustment by hand when desired.



Double Cylinder Planing and Matching Machine.

To prevent shavings produced by the side cutter from being scattered over the machine, hoods are fitted to each hanger about the cutter heads to direct all shavings away from the machine. Pressure dogs are placed after the cut of the matcher heads to hold the material firmly while being matched. The matching works are placed after the lower cylinder, the material thus being brought to an even thickness before being operated on by the side cutters. The feed works consist of six rolls 7 inches in diameter, and with large journals, one pair, placed after the matcher works, keeping the board in a straight line and feeding it entirely away from the machine. The feed rolls, mounted on planed upright stands, are fitted with socket joints and connected at each end by heavy expansion gearing with double or outside links, and are heavily weighted. The weighted levers are inside the machine and move with perfect freedom. The feed of the machine is very powerful, the rolls being large, and the belting, gearing and weighting being so proportioned as to allow no slipping. The front platform has two rollers in it to relieve heavy timbers of friction, and this platen is arranged to admit of using the regular arm for holding the material against the guide, or a wooden lever, as preferred.

An Attractive Tour.

The Pennsylvania Railroad Company inaugurated a series of personally conducted tours to the north this season, the last one of which started on Aug. 20. These tours gave such excellent satisfaction that it is probable similar ones will be run next season. They traversed more than 1,700 miles of the mos magnificent country, and a participant in the last tour, an extensive traveler, states that in his experience he has found no other tours of equal distance so replete in points of genuine interest, every one of which is in itself well worth the trip. The stop at Quebec, a new feature, added greatly to the success of the last tour. The names of the places visited are familiar to all and suggestive of wonderland. No matter how much may be expected, one cannot be disappointed in Watkin's Glen, Niagara Falls, Thousand Islands, Quebec, Montreal, Au Sable Chasm, Lakes Champlain and George, Saratoga, or the Highlands of the Hudson. The round-trip rate of $100 from New York, Brooklyn, Newark, Trenton, Philadelphia, Harrisburg, Baltimore, and Washington covered all necessary expenses during the time absent.

Says Bridget to Pat: "And how do you loike bein' on the jury, Pat?" Says Pat: "It's somewhat confinin'." "Yes," adds Bridget, "and it's harrd wurrk, too." "Well," says Pat, "it's aisy enough deciding which soide is right when only one of thim's Oirish, but when they're both Oirish, bedad, it's the very divil."

It is reported that the Damascus Steel Company has been incorporated at Des Moines, Ia., with an authorized capital stock of $500,000 to engage in the manufacture of steel under a process invented by S. R. Dawson, who claims that he is in possession of a secret which enables him to reproduce the Damascus steel of the ancients.

The Siemens-Halske Company, of Chicago, elected the following officers at its annual meeting: President, A. W. Wright; Vice-President, Charles E. Yerkes; Secretary, F. B. Badt; Treasurer, O. W. Meysenburg.

The United States Metallic Packing Company, Philadelphia, Pa., has opened up a Chicago office at No. 1003 Marquette Building, and placed it in charge of Messrs. H. A. Pike and E. N. Hurley.

"What is the greatest difficulty you encounter in a journey to the Arctic regions?" asked the inquisitive man. "Getting back home," was the prompt reply of the professional explorer.

The Union Grease Company, of Boston, has issued a pamphlet explaining the merits of Union grease as a lubricant. It also gives some instructions in regard to the use of this material. Union Grease is a combination of hydro-carbon oils and animal fats, without any admixture of potash, soda, graphite or asbestos. It is a pure grease containing the least possible water. Its virtues are largely due to the method of manufacture. It is produced without direct heat by the best machinery; with a view to economy in handling, and uniformity in quality and consistency.

The Baltimore & Ohio Southwestern Railroad Company is making extensive additions to its shops at Washington, Indiana, and has just contracted with The Lodge & Davis Machine Tool Company, of Cincinnati, for several large lathes, planers, milling machines and other heavy tools.

The Boston Belting Company, of Boston, has secured the services of Mr. Thomas R. Freeman to look after its railroad trade. Mr. Freeman is probably one of the most widely known men in the railway supply business, having formerly been connected with the Hale & Kilburn Manufacturing Company. He will devote his time and attention to the railroad trade of the Boston Belting Company throughout the country, probably making his headquarters in Chicago. The Boston Belting Company manufactures all kinds of vulcanized rubber goods, vulcanized rubber belting, hose packing and mechanical rubber goods of every description.

Mr. C. F. Collins, President of the Memphis Car and Foundry Company, has appointed Mr. Sam'l T. Rowley Superintendent of the Memphis plant of the company.

The Gould Coupler Co. announces that the recent destruction by fire of its forge plant of Buffalo had nothing whatever to do with its coupler works. It is now turning out between 500 and 600 couplers a day, and can ship all orders promptly. The forge plant will be running again in about 30 days.

The Chicago Rabbited Grain Doors are specified on 1,500 box cars for the Great Northern Railway, being built by the Haskell & Barker Car Co. of Michigan City.

The Aschman Steel Casting Co., whose plant at Sharon, Pa., was destroyed by fire two years ago, has been reorganized and the following officers elected: Hon. E. A. Wheeler president, J. J. Spearman treasurer, and W. K. Naylor secretary. Contracts were let for the rebuilding of the plant, and it is expected to be ready for operation in the fall.

The Franklin Steel Casting Co. (of Pennsylvania), has been organized by electing the following named officers: President, Charles Mackey; First Vice-President, Henry M. Wilson; Second Vice-President, James W. Rowland, and Treasurer, William J. Bleakley. A site for the plant will be selected and work on the buildings begun at once. The company will manufacture automatic car couplers, the Wheeless draft box and the Maher truck bolster and other railway supplies. Mr. J. N. Maher, recently superintendent of the American Steel Casting Company's Works, at Alliance, Ohio, will be superintendent of the new plant.

"I hope you will not spend this dime for rum," said the generous man. "Rum! Do you take me for a Yankee sailor? I am a bawn Kaintuckian, sah."

"Say, Rusty, what was de cause o' yer quittin' work?" "Well, de doctor tol' me ter rest awhile after each meal."

"In de case of de trusted employee," said old Uncle Eben, "you kain't allus jedge by appearances. But you is sometimes 'bliged ter fohm berry positive conclusions by disappearances."

Our Directory

OF OFFICIAL CHANGES IN AUGUST.

We note the following changes of officers since our last issue. Information relative to such changes is solicited.

Altoona & Phillipsburg Connecting.—Geo. M. Case is appointed General Manager, vice W. T. Forsyth, resigned.

Baltimore & Ohio Southwestern.—E. E. Jenks, Master Mechanic of Mississippi Division, is transferred to Seymour, Ind., and is succeeded by C. E. Walker.

Charleston & Savannah.—G. M. D. Riley is appointed Master Mechanic, with office at Savannah, Ga.

Chicago, Rock Island & Pacific.—General Superintendent Chas. Dunlap died Aug. 4, and is succeeded by A. J. Hill.

Columbus Southern.—T. E. Blanchard is appointed Receiver.

Florida Southern.—W. H. Young is appointed Master Mechanic, with office at Sandford, Fla.

Gulf, Beaumont & Kansas City.—James Smith is appointed Master Mechanic, with office at Beaumont, Tex.

Grafton & Upton.—L. W. Morse is appointed Superintendent, with office at Grafton, Mass., vice F. W. Morse, resigned.

Jamestown & Lake Erie.—E. T. Haines is elected Vice-President and General Manager, with office at Jamestown, N. Y.

Kansas City, Watkins & Gulf.—Thomas Saunders is appointed General Manager, with office at Lake Charles, La., vice F. S. Hammond, resigned.

Middle Georgia & Atlantic.—Joseph W. Preston is appointed Receiver with office at Eatonton, Ga., vice W. B. Thomas, resigned.

Monterey & Mexican Gulf.—J. M. Carr is appointed General Foreman of Motive Power and Car Department; office, Monterey, Mex.

Northern Pacific.—Master Car Builder J. C. Barber has resigned and the office is abolished. Alfred Child is appointed General Foreman of Como car shops, with jurisdiction over those at St. Paul and Minneapolis. Superintendent of Rocky Mountain Division W. H. Brimson has resigned and is succeeded by E. J. Pearson; office, Missoula, Mont. F. E. Potter is appointed Acting Superintendent of Missouri & Yellowstone divisions, vice E. J. Pearson; office, Glendive, Mont.

Ohio Southern.—Receiver Geo. W. Saul has resigned, and is succeeded by Messrs. McGrew & Mathews.

Pennsylvania.—Alexander Kearney is appointed Assistant Engineer of Motive Power of United Railroads of New Jersey Division, with office at Jersey City. W. B. Page is appointed Assistant Engineer of Motive Power Philadelphia & Erie and Northern Central lines. James Milligan is appointed Assistant Engineer of Motive Power of the Philadelphia, Wilmington & Baltimore. D. M. Perrine is appointed Assistant Master Mechanic of the Altoona shops.

Southern Pacific.—E. P. Randolph succeeds J. H. Noble as Superintendent of the Yuma and Tucson divisions; office, Tucson, Ariz. J. H. Noble succeeds H. Cooley as Superintendent of the Shasta division; office, Dunsmuir, Cal.

Texarkana & Fort Smith.—A. A. Campbell is appointed Master Mechanic, with office at Texarkana, Tex.

Union Pacific.—The jurisdiction of Master Mechanic of Idaho Division, J. F. Dunn, is extended over the Salt Lake Division.

Wilmington & Sea Coast.—Capt. Oscar Grant is appointed General Manager.

Employment.

WANTED.—By a gentleman of wide railroad and manufacturing acquaintance, and one who can furnish first-class references, a position as traveling or local agent. Salary moderate. Address "B," care NATIONAL CAR AND LOCOMOTIVE BUILDER, Morse Building, New York.

WANTED—With a reliable and progressive house, catering to the railroad trade, a position by a steady and sober young man who has traveled and sold goods to other trade, and also has a general and practical knowledge of mechanics, and possesses executive ability to handle men and work to best advantage. Best of references. Address "H," NATIONAL CAR AND LOCOMOTIVE BUILDER, Morse Building, New York.

NATIONAL CAR LOCOMOTIVE BUILDER

OCTOBER, 1895.

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The first railroad in Syria, extending from Damascus to Beyroute, has been opened to traffic.

The Boston & Maine Company has increased the pay of all passenger conductors running into Boston 25 cents per day.

The Baltimore & Ohio Southwestern line between Cincinnati & Louisville is being relaid with 75-pound steel rails.

The wharf and freight sheds of the Boston & Albany Railroad, at East Boston, were burned Sept. 4; loss about $500,000.

The roundhouse of the Long Beach Railroad at Barnegat, N. J., was burned Sept. 3. A locomotive and two cars were burned.

The contract for 13,000 tons of 85-pound rails for the Columbia & Maryland Electric Railroad, has been placed with the Johnson Company.

A new rule in force on the Panhandle requires that when trains part on the road the trainmen must report the kind of coupling that caused the accident.

According to the annual report of the receivers of the Northern Pacific, the strike in July, 1894, caused a loss of $600,000 in net earnings to that company.

The largest belt in the world is that recently put in service in a wire factory in Worcester, Mass. It is 78 inches wide, 118 feet long and weighs over 1,000 pounds.

Twelve German soldiers were killed and 60 injured in a collision between a train carrying 1,200 soldiers with a standing freight train at Oederan, Saxony, Sept. 19.

The Union Pacific has placed an order with the Ensign Car and Manufacturing Company, of Huntington, W. Va., for 40 new grain and fruit cars for delivery by Oct. 15.

Charles F. Gleed, one of the directors of the Atchison, Topeka & Santa Fe Railroad Company, said recently that the property of the corporation is now in better shape than ever before.

The fifth annual meeting of the American International Association of Railway Superintendents of Bridges and Buildings will be held at New Orleans, La., October 15, in the Hotel Grunewalde.

Ground was broken Sept. 3 by the Illinois Steel Company at Joliet, Ill., for a large spike mill, to cost $200,000, and to employ 300 men. The building will be pushed and ready for business by December.

The depot and roundhouse of the Rome, Watertown & Ogdensburg at Cape Vincent, on Lake Ontario, were wrecked by a storm Sept. 11. About 20 people were injured by the collapse of the depot, two fatally.

Two coaches of a passenger train on the Kansas City, Memphis & Fort Scott jumped the track Sept. 7, while crossing Indian Creek, near Monmouth, Kan., and went down into the stream. Fifteen persons were hurt.

It is said that the officials of the Grand Trunk road are considering the advisability of adopting electric motors for the St. Clair tunnel to avoid smoke and the deteriorating effects of the smoke, steam and other gases from locomotives.

The Russian railroads are nearly all making considerable progress toward the substitution of petroleum for coal and wood for locomotive fuel. Many locomotives are being altered accordingly at an approximate cost of about $330 per engine.

The Columbus, Sandusky & Hocking Valley Railroad was sold at Bucyrus, O., Sept. 14. to W. E. Guerrin for $4,100,000. Mr. Guerrin represented G. W. Sinks, of Columbus, and D. B. Hatch, of New York, the committee of the bondholders.

The prosperity of American tin-plate manufactures is seriously threatened by the rapid advance in the price of soft steel. It is said that American makers cannot pay over $20 per ton for steel bars and compete successfully with the Welsh makers.

It is said that the salary of Mr. C. P. Huntington, President of the Southern Pacific Co., is but $10,000 a year, which is much less than that paid some other officers of the company, and only about a third of that paid the late A. N. Towne as general manager.

It is stated that 1,352 trains leave and arrive at Chicago daily. Of these, 294 are through express and mail trains and 640 are accommodation and suburban trains; the remaining 418 being the average number of merchandise, grain, stock and lumber trains.

The Illinois Steel Company advanced the price of standard steel rails from $25 to $29 a ton Sept. 11. This is one of the sharpest advances in the price of steel rails that the trade has ever known. In the early part of the year the price in Chicago was $22 a ton.

Reports of fifty railroad systems for the first week in September show that thirty return gains in gross earnings over those of last year of $257,427, or 5.2 per cent., and twenty return losses of $171,140, or 7.8 per cent. The whole shows a gain of $86,287, or 1.3 per cent.

What is said to be the largest gas holder in America has recently been completed at Ravenswood, L. I., for the New York and East River Gas Company. It has a capacity of 5,000,000 cubic feet. When the holder is filled with gas the crown is 230 feet above the level of the ground.

The Duke of Sutherland has added to his love for yachting a taste for locomotive running. He is having a private train built for himself. He is said to be an expert engineer and delights in locomotives. On the first trip of the new train the young Duchess is to be permitted to run the engine.

Work on the San Joaquin Valley Railroad, in California, is being pushed rapidly, but some delay has been caused by slow transportation of material. The right of way through the great valley from Stockton to Fresno has been secured practically without expense, as nearly all the farmers gave the land required.

The Spanish cruiser *Sanchez Barcaiztegui* was sunk in collision with the steamer *Mortera* in the harbor of Havana, Sept. 19. Admiral Parejo and 34 men of the warship, including Captain Ybanez and three officers, were drowned. The remainder of the crew, 116 in number, were saved.

The report of the New York, Chicago & St. Louis Railroad for the year ended June 30 last shows: Gross earnings from operation, $6,012,062; operating expenses, $4,744,623; other income, $6,942; fixed charges, $1,065,938; surplus, $208,443; total surplus on June 30, 1895, $132,158; cash on hand, $469,370.

The Southern Railway has announced that it will supplement its two daily limited trains between New York and Atlanta by the addition of a third, to be known as the "Exposition Flyer." This will make the run between New York and Atlanta in 22 hours. This additional service will begin about Oct. 1.

A representative of the Baldwin Locomotive Works, with an expert electrician from the Westinghouse Company, together with Sir Henry Tyler, ex-President of the Grand Trunk, have left for Peru, where, it is said, a test of the adaptability of the electric locomotive is to be made upon a railroad 15,000 feet above sea level.

President Ingalls, of the "Big Four," has given instructions that, wherever possible, if a married man is killed in the company's employ, his wife or children, if old enough, should be given employment to aid in supporting the family. A number of wives of deceased employees, under the order, are now in the company's service.

The report of the Lake Shore & Michigan Southern Railroad for the year ended June 30 last shows: Gross earnings from operation, $19,825,535; operating expenses, $12,724,227; other income, $400,420; fixed charges, $4,660,890; net income, $2,840,837; dividends, $3,021,340; deficit for year, $180,502; total surplus on June 30, 1895, $11,875,851; cash on hand, $847,921.

There is some talk that the Baltimore & Ohio road will extend its system to Kansas City by building a connection between the present terminus of the Baltimore & Ohio Southwestern at Beardstown, Ill., and Quincy, the terminus of the Quincy, Omaha & Kansas City Railroad. This line will be used to Trenton, Mo., whence a 70-mile extension will complete the road to Kansas City.

Two passenger trains collided on the Great Northern Railway Sept. 11, near Ashby, Minn. Both engineers and one of the firemen were killed. One mail clerk and an express messenger were also killed, and two brakemen; two mail clerks and an express messenger were seriously injured. Six passengers were injured. This is said to be the worst wreck in the history of the road.

In Russia the entire railway system is now under Government administration, accompanied with immense reductions in freight and passenger rates, and increases in the speed and frequency of the trains. Several years have been occupied in effecting the transfer of the system from private companies. All the influence of the Government is now brought to bear in improving and cheapening the service, which was not exclusively nor mainly the aim of the superseded companies.

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A test of the Holtzer armor-piercing projectiles, manufactured by the Midvale Steel Company, of Philadelphia, was made Sept. 19 at Sandy Hook, and proved highly satisfactory. Four of the projectiles were fired at 11¼-inch nickel steel armor plate, and in each case the projectile passed cleanly through the plate, then through 3 feet of oak backing, and penetrated for a considerable distance into the sand butt. The projectiles were then dug out and found to be in perfect condition. Each shell weighed 57 pounds.

The Mount Ivy station and freight house of the New Jersey & New York Railroad were burned Sept. 4, and much of the debris fell on the track. Miss Martha M. Gurnee, the agent, showed considerable courage and presence of mind. Unassisted, except by her younger brother, she rolled several barrels of kerosene from out the burning freight house, and, as her standard flagging apparatus was consumed, she made herself famous and saved a passenger train from possible damage by removing her petticoat and flagging the train.

A despatch from Berlin to the New York *Herald*, dated Sept. 22, says that according to advices from St. Petersburg, agents of an American company are in negotiation with the Russian railway companies with the view of supplying them with 300 new locomotives. The American agents met the Russian representatives at Nijni Novgorod on Friday, when it was decided that a Russo-American company should be formed for the purpose of establishing a locomotive manufactory in Russia, the works to be managed by Americans.

The growth of electricity in street railroad traction has been very marked of late years. Statistics recently published by the *Street Railway Journal* show that there are now in the United States 13,588 miles of street railroad tracks, of which 632 are operated by cable, 679 by miscellaneous means, 1,914 by horse power, and 10,363 by electric power, the latter being nearly 76 per cent. of the whole. The cars employed number 44,475, and the capital stock and funded debt of the various companies aggregate $1,300,000,000. This gives an average of $95,600 for a mile of track.

A Buffalo paper says that Niagara Falls is going to be the convention city of the future and the Monte Carlo of America. Already plans are far advanced looking to the establishment there of one of the most gigantic permanent convention halls ever conceived on this side of the Atlantic, and the erection of a clubhouse which will be the wonder of the world. The clubhouse is to cost when furnished $500,000, and the Dalys, and Mitchell, late of Saratoga, are said to be interested in it. The convention hall will have a seating capacity of 15,000, and will be fireproof.

The regular monthly meeting of the presidents of the Vanderbilt system of railroads was held at the Grand Central station, New York, Sept. 19. Mr. Depew in speaking of the condition of these lines said: "We are now in better shape than we have been for some time, owing to restored rates and the prospect of their being maintained. Then, again, the crops this year are exceptionally large, and that is going to make a good carrying trade. That makes it good for the railroads, the farmer, the merchant and every one else. We could not at the meeting help commenting upon the good outlook for the coming year."

The Columbian Liberty Bell, on its trip around the world, was sent from Chicago, Friday, Sept. 13, to Atlanta where it will remain until the close of the Exposition. After that it will be taken through the Southern States and Mexico. From there it will go to Europe and thence around the world. Superstition, evidently, does not exist with those who started the bell on the day named, or they would have paid more respect to the traditions of Friday and 13. Before it had gone far the bell was attacked by a madman, who beat it with a sledge hammer with the intention of breaking it, but he only succeeded in making some perceptible dents.

The Master Painters' Convention.

The 26th annual convention of the Master Car and Locomotive Painters' Association, was held in Cincinnati, Sept. 11, 12 and 13. In discussing the best method for cleaning the interior of passenger cars that are not to be varnished inside the general opinion expressed was to the effect that plenty of soap and water is best. Mr. Little, of the Pennsylvania, said that in some cases the varnish on the interior of coaches was deadened by blowing the dust from it with compressed air, the small particles of dust in the air damaging the varnish when striking it at high velocity.

Vibration and shrinkage and expansion of wood were named as the principal causes of cracks in applied paint and varnish, although painters are sometimes to blame for careless application of improperly prepared paint. In papers read by Messrs. L. E. Owen, of the St. Louis Southwestern, and Henry Block, of the "Big Four," it was held that after burning off old paint from passenger cars it is unnecessary to sand paper or plane the surface if the burning off is done properly; but a vote was carried that the use of rough stuff should be continued in surfacing burnt off paneled cars as well as on new paneled cars, as no other method has given as good results. It was agreed that it is not advisable to varnish caboose cars outside, and that metallic paint is best for the exterior of freight cars, and white letters. Prepared paints are in favor with a majority of the members.

There were some papers read on the painting of locomotive tenders which we hope to publish extracts of in our next issue. The convention elected Mr. William Garstang, Superintendent of Motive Power of the "Big Four," and Mr. John S. Lentz, Superintendent of Car Department of the Lehigh Valley, honorary members. The officers elected for the ensuing year are: President, Chas. E. Copp, Boston & Maine; First Vice-President, Chas. W. Mason, Pennsylvania; Second Vice-President, D. B. Vail, N. Y., L. E. & W.; Secretary and Treasurer, Robert McKeon, N. Y., P. & O.

Damascus Steel.

As announced in our last issue, the Damascus Steel Company, of Des Moines, Ia., has been formed to make a new kind of steel under a process invented by Mr. S. R. Dawson. Mr. Dawson claims to have discovered the lost art of making "Damascus steel." He has exhibited in Chicago some samples of cutlery made from the metal, which have an edge keener and smoother than a steel razor. This was demonstrated by a microscope and photography. The new metal is a combination of copper and tin and two other elements which Mr. Dawson keeps secret. A dagger made from it looks like polished gold. Mr. Dawson claims to be a lineal descendant of Ralph Hogge, who cast the first iron cannon made in England, and his ancestors on both his father's and mother's sides have been workers in iron and steel. He says his discovery is partly accident, but primarily the reward of years of labor, research and experiment. He claims that the new steel or hardened copper is suitable for any kind of cutlery from a common pocket knife to the most delicate surgical instrument, and that no deleterious oxide forms on it under the most severe tests. Any steel drill forced against it when it is hardened will break.

Success of Electric Motive Power on the Nantasket Beach Road.

Speaking recently of the results of equipping the Nantasket Branch of the New York, New Haven & Hartford Railroad with electric motors and cars, Mr. J. R. Kendrick, Third Vice-President of the Company, said:

"We are entirely satisfied with our experiment on the Nantasket Beach business; the season having demonstrated the fact that the cheap and frequent trains create traffic. The passenger statistics for the summer just closed show an increase of 300 per cent. over those for the season of 1894, and next year we expect these figures will be beaten. The tests made the other day in the matter of demonstrating the practicability of electricity in its relation to the freight business were also eminently satisfactory, and mean a great deal in the application of the current to all branches of rail transportation. In regard to the report that our company was taking steps looking to the equipment of the link between Nantasket Junction and Braintree with electricity, I am at liberty to say that it is in every way correct. The plan that will be carried out provides for four tracks, the two outer for trolley cars, and the inner for steam. The center tracks will be fenced in, so that there will be no possibility of injury to passengers when taking the electrics. We expect to have the line in full working order and running in connection with the Nantasket Beach branch by the first of next season. It has been practically decided to use the current, in connection with steam, as far out as Readville and Dedham on the Providence division. There will be four tracks on the elevation, the outer ones being for trolley cars."

The Atlantic Coast Line, it is said, intends to make a strong bid for a good share of the travel to the Atlanta Exposition. The question of putting on a through fast train to Atlanta has occupied the attention of the officials of that line for some time. and a new vestibuled service has been decided upon.

New Tank Locomotive for the Metropolitan Railway.

Our English contemporary, *Engineering*, publishes in its last issue a description and illustration of a new type of tank locomotive employed on the Metropolitan Railway of London, of which Mr. T. F. Clark is Locomotive Superintendent. A large part of the work of the engines on this road is done in tunnels, and to avoid exhausting steam into these the exhaust steam from the cylinders is condensed in the feed water tank that straddles the boiler of each. We quote the following description of the new engines from the paper named:

"The engines are of the inside cylinder type, with four wheels coupled, and the front end is carried on one pair of wheels fitted with axle-boxes with an arrangement for side play on the curves. The general arrangement of the engine, and the dimensions adopted, are such as have resulted in a machine of great handiness and special facility in getting away quickly with its loads from stations, a matter of much importance in view of a traffic which is now exceedingly heavy both in number and weight of trains. A comparatively high tractive power is obtained by the use of driving wheels of moderate diameter (5 feet 3 inches), but which are yet large enough to permit of the engines running easily at the highest speeds required by the Metropolitan Company's traffic. In the general design of the engine, the avoidance of all unnecessary deadweight has been aimed at. All through, the engine is as light as possible, consistently with the proper strength of parts, a good allowance of adhesive weight proportionate to the tractive power, a sufficient tank capacity for condensing purposes, and sufficient heating surface and grate area for keeping steam while condensing the exhaust steam in the tunnels. The boiler is of steel plates, with copper inside firebox of the usual form, fitted with a brick arch and air deflector. The frames are of steel, placed as far apart as possible to admit a wide firebox, and set in at the front end to allow of the side play of the leading wheels. The cylinders are of the usual inside type, with steam chest between, the valve motion being of the Allan straight-link type. All the axles are of steel. The tires are of steel 3 inches thick. The wheel centers are of cast steel. The boiler is fed by two pumps. There are also two injectors, but the latter are, of course, not used in ordinary tunnel work, on account of the high temperature attained by the water in the tanks when the exhaust steam is being condensed. The condensing arrangement is in its general features similar to that which has been long adopted on the Metropolitan Railway, with flap valves for the diversion of the exhaust steam, and a large discharge valve at the back of the engine for quickly emptying the tanks of hot water. The engines are fitted with the automatic vacuum brake.

The principal dimensions are:

	ft.	in.
Cylinders, diameter	0	17
" stroke	0	24
Leading wheels, diameter	3	6
Driving and trailing wheels (coupled), diameter	5	3
Fixed wheel base	8	0
Total "	15	6
Frames, thickness	0	1
" distance between front	3	11½
" " " back	4	1½
Boiler, diameter of barrel	4	1
" length of barrel	10	4
Firebox, length outside	5	6
" width outside	4	0
" depth inside at front to top of firebars	5	1¼
Tubes, number	206	
" external diameters	1¾ in.	
Heating surface, firebox	93 sq. ft.	
" " tubes	1,000	"
Grate area	16¾	"
Capacity of tanks	800 gals.	
" coal bunker	effective 1½ tons	

Broader Views Needed.

Speaking of the International Railroad Congress and its advantages to railroad officers, Mr. Chauncey M. Depew said before it met: "There is one thing that every railroad man should have, and that is liberality of ideas. A man who sticks to his division for four or five years without a change or mingling with his fellow railroad men, soon forgets that 'the world do move.' He is like a man who works in a tunnel; he loses individuality, and does not seem to imbibe the progress that is going on all around him. He needs to be educated.

"I know personally many of the gentlemen who will go as delegates to this conference, and I will say concerning some of them that if there is one thing in the world that they need it is a head-end collision with new ideas and systems that will knock some of the old fogy ideas out of their heads and open their eyes to the egotism they have held to."

The American record for an hour's bicycle riding was broken at a race in Springfield, O., Sept. 12. F. J. Titus covered 27 miles and 185 yards in an hour.

The Pennsylvania Railroad Company, it is said, contemplates spending $2,000,000 on a site and building for a new passenger station in Pittsburg.

An axle beneath a dining-car on the Minneapolis, St. Paul & Sault Ste. Marie R. R. broke while running Sept. 10, derailing the three rear cars of the train, two of which rolled down an embankment into the ditch. Several persons were seriously injured. The train was only four feet from a high bridge when the accident occurred, so that a much greater disaster was but narrowly averted.

Informal Ballot on Grabirons.

The Secretary of the Master Car Builders' Association announces that the informal ballot on modified recommended practice in grabiron or handhold location, ordered by the Executive Committee, as per circular of Aug. 22, 1895, resulted as follows:

Votes cast "Yes,"		653
" " "No," Unqualified	180	
" " "No," Qualified	140	320
Total votes cast		973

Of the qualified votes cast against the proposition, 85 votes objected to the location of handholds underneath the end sills, and 51 votes objected to the handholds in the higher locations on the ends of box and stock cars.

As there are 1,477 possible votes in the Association, it is impossible to say from this test ballot what modifications can be adopted in 1896 in the recommended practice for handholds, notwithstanding the fact that more than two-thirds of the votes cast at this time are in favor of the proposed modifications.

American and European Railroads.

Mr. J. T. Harahan, Second Vice-President of the Illinois Central, recently returned from a trip throughout Europe, and, speaking of his observations of the railroad systems abroad, has said:

"The European roads certainly cannot compare with the American except in one particular, and that is the stability and permanency of construction. In this they excel us. But in management, equipment and general facility and cheapness of transportation we are far superior. Of all the foreign roads I think the English are the best, and the French next. The advancement of the German system is, I think, hampered by government control. All European systems have heretofore followed the English lead, but they are now looking to America. At present our entire system is very distinctive and is not closely patterned by any foreign road. But they are gradually recognizing the superiority of our equipment and method, and I believe that before many years our system will be universally adopted throughout the world."

A Curious Railroad Contract.

The Great Western Railroad, of England, has recently had to pay $500,000 to free itself from the obligation to stop every train at Swindon Station for 10 minutes. In 1841, before the road had reached Bristol, it made an agreement for 99 years with a firm of builders to hold every train carrying passengers, "not being sent express or for special purposes, for a reasonable period of about 10 minutes," at Swindon, in consideration of the erection of suitable refreshment rooms for which a rent of a penny a year was to be paid. The railroad soon found out the inconvenience of the arrangement and tried to break it. The courts in 1846, and in 1872, held that "express" did not mean in the contract what is now meant by an express train; but the price asked for the annulment of the concession was always more than the company was willing to pay. After a fight of over 50 years it has been driven by the competition of other roads to buy out its opponents, and the 10-minute stop of fast expresses at Swindon is now a thing of the past.

The Pennsylvania Railroad's Cab Service.

The Pennsylvania Railroad Company has for some time operated a line of cabs in connection with its depot in Philadelphia, in order to save its patrons from the exorbitant charges of the city cabmen. The plan has been highly successful and has given a great deal of satisfaction to all concerned. The charge for a hansom for a distance of a mile and a half is only 25 cents, and that for a four-wheeled cab for the same distance is 40 cents. For each additional mile the extra charge is 15 cents for the hansom and 25 cents for the four-wheeler. Trunks are carried on the cabs for 25 cents each. There is no extra charge for satchels carried inside the cabs or hansoms, but the charge for carrying a satchel on the top of a cab is 10 cents.

With the opening of the new Pennsylvania Railroad ferry from Jersey City to the foot of Twenty-second street, New York, a similar cab service is to be established in connection with it. The outrageous charges of New York cabmen have long been one of the standing disgraces of the city, and it will be as gratifying to travelers as it will be creditable to the railroad named to break the backbone of this kind of robbery.

In common with other railroads, it has been the practice of the Burlington to charge on all baggage left in its stations over 24 hours 25 cents for the first day and 10 cents for each succeeding one. These charges have just been abolished.

The Pittsburgh Reduction Company, which on Aug. 26 received the first supply of electric energy generated by the Niagara Falls Power Manufacturing Company, began operations two days later in the manufacture of aluminum. About 1,600 horse-power was furnished by the power company. This was increased to 3,000 horse-power Sept. 23. and, it is said, a further increase to 5,000 horse-power will be made when sufficient men have been taught the necessary work.

Lead for Locomotives.*

BY C. A. SELEY.

Having read Mr. C. H. Quereau's article on the above subject, which was printed in the *Railroad Gazette* of Aug. 9 and also in the September number of the NATIONAL CAR AND LOCOMOTIVE BUILDER, and being greatly interested in the subject I desire to engage the attention of the members of the club for a few moments' consideration of what may be a very important feature in the successful operation of locomotives. The position taken by Mr. Quereau differs somewhat from that generally accepted and practiced, but it will be the aim of this paper to confirm some of the conclusions stated in the article. My experience in this line, though very limited, in comparison with that of the gentleman quoted leads to similar conclusions.

As there may be some here that have not seen the article in question, the conclusions reached by Mr. Quereau are here quoted :

"There are a large number of locomotives now running which have too great a lead in the running cut-off. In the opinion of the writer, this is true of a majority of locomotives.

"A proper reduction of the lead in the running cut-off will decrease the running repairs and time lost because of engine failures, slightly increase the coal economy and increase the speed capacity of most locomotives.

"The proper lead for the running cut-off is the greatest that can be used, and secure a full, smooth compression line without a loop at the top.

"This can be determined only by the use of an indicator.

"Positive lead in full gear is of no advantage so far as the working of a locomotive is concerned, but rather a detriment, nor is any power lost by making it negative within reasonable limits.

"Lead is not needed on a locomotive for a cushion at any speed or for any cut-off.

"Inside clearance cannot remove the bad effects of too much lead, and should not be given till the lead has been properly adjusted.

"Lead should increase as the speed increases. Hence, freight engines do not need as much lead in the running cut-off as passenger engines."

Anyone who has indicated various styles and makes of stationary engines, or has studied the diagrams produced from them, will have noted that few, if any, have either the early compression or the amount of lead common to the locomotive in the running notches. The amount of clearance and counterbalance has much to do with this and other conditions differ, but as a rule excessive lead is exceptional in stationary practice.

An engine without compression will be very hard to adjust for still running. I have in mind a certain make of stationary slide valve engines that produced a card like a heelless slipper with the toe turned up. Owing to the proportions of the valve the exhaust took place at the very end of the strike, causing considerable back pressure, particularly at the beginning of the return. There was absolutely no compression and consequently the opening of the valve had to be very finely adjusted to prevent pounding, and these adjustments had to be made at frequent intervals. This was before the days of extensive indicator practice. This was an engine that was run at a fixed speed and fairly uniform lead, but with a locomotive the case is very different, as all speeds and amounts of work must be provided for and with equal advantage so far as possible in each situation.

If as stated, lead is not necessary for a cushion at any speed or cut-off, what is its office ? It is impossible to entirely eliminate it though the valves be set blind a considerable amount in full gear. When we try to conceive the rapidity with which the various functions of a slide valve are performed at high speed, then will appear the solution of the matter.

Mr. Quereau shows a diagram taken from a locomotive running at a speed of 247 revolutions a minute. This means a revolution in less than one quarter second, and the period through which compression and lead operate is practically one quarter of that quarter second. Supposing this diagram to be from an 18-inch cylinder, and the initial pressure 140 pounds, it means that we impart a total pressure of 35,600 pounds on the piston in $\frac{1}{16}$ of a second.

Owing to the relatively large clearance in locomotive cylinders, the compression does not generally attain a pressure equal to boiler pressure, but if this pressure be supplemented with excessive lead the pressure is quickly brought up and with the piston still traveling against it, there is a possibility of the contents of the cylinder giving momentary pressure far above boiler pressure, as the time may be too short for the current of incoming steam to reverse in direction of motion. This is supposition, but in any event the card shown by Mr. Quereau has loops in the line following the lead admission, and the steam admission and expansion lines are very wavy, showing that the indicator piston has been subjected to a violent shock lasting in effect through one quarter of the revolution. With a reduced amount of lead but still sufficient to bring up the initial pressure to boiler pressure, a card taken from the same engine with all other conditions the same, except that the speed is increased five revolutions, shows smooth lines without loops or waves. The characteristics of these diagrams are an index of what the engine is subjected to. In the first instance the shock so plainly evidenced by the card, must of necessity also act on all parts of the running gear, frames, piston rods, pistons, rod straps and other parts. It is no wonder that many runners will prefer to use a longer cut-off and throttle the steam, rather than have the discomfort of the jarring and pounding incident to the use of short cut-off with lead as often used.

In the other case the full pressure is reached only when it is needed to start the piston on its return. The mean effective pressure in the latter case is a trifle higher than before, therefore there is no loss but a gain in every direction—larger expansion, later exhaust closure, better economy, as well as more satisfactory operation.

It is evident that lead has its use in combination with the compression in so timing the admission of steam to the piston, that this great pressure, delivered so quickly as to be almost a blow, shall act not destructively but effectively and quietly and at the right time. It is well known that with Corliss engines and those having quickly opening and closing valves, that the steam pipe and connections have to be put up in the best possible manner on account of the sudden starting and checking of the current of steam, acting like blows of a hammer. We think of steam as having a most elastic nature, but there is some limit to this quality and we begin to experience the effect of some of the limitations in handling steam at very high speeds.

The setting of valves in the shop, as to the lead, is often deceptive, as cards have shown. By indicating, in full gear and large throttle opening, it is found that the unbalanced load on the valve will take up loss motion, and perhaps spring the valve gear to that extent that engines are actually blind in full gear when they are supposed to have positive lead.

Our different styles of engines, with various lengths of main rods and eccentric blades, introduce angularities and distortions in the valve movement, so that it is impossible to say what the lead will be in, say, 6 inches cut-off, unless the motion be squared at that point—and even then, unless previous indicator tests have been made under required conditions of speed and pressure, it is hardly probable that the best results will be reached by shop setting only.

If engines were turned out mathematically correct, my "tale of woe" perhaps need not be told, but the struggles there are sometimes to cure lame engines and the tales we hear about how much better engine 94 is than 95, when they are of the same make, style, size and condition, might all be made clear by the indicator diagram. It will show the distribution of steam, whether equal as between both sides of the piston or between both sides of the engine; sufficiency or deficiency of area of steam pipes and ports, and also tell some things about nozzles. It may preach a sermon about the necessity of finer graduation of quadrants or it may confound the pretentions of some runner that can do wonders in the center notch.

Supposing then that it be considered advisable to use the indicator for setting locomotive valves, or at least in checking up the shop setting, what is the best way of doing the work? Most roads are not provided with a testing pit and wheels upon which to run and test engines, and until all reach that improvement the indicator test will have to take place on the road. I have a way of my own, by which I have been enabled to quickly correct most irregularities.

A set of cards are taken with the engine running slowly so as to sharply define the points of admission, cut-off, release and compression. These are taken in full gear, forward and back, center notch forward and back, and the first, second and third notches both sides of the center. In case the full gear cards show correctly as to lead, the cards nearest a 6-inch cut-off are then compared and the cut-off equalized by alteration of blades. If one side is found to work stronger than the other, and it can be corrected by shimming the tumbling shaft boxes, this is done. After satisfactory cards are obtained in these notches another full set is taken, and then, if possible, the engine is run at considerable speed in order to obtain cards approximating those from actual service.

If the previous work has been carefully done, these will show a very even distribution of steam in the notches, where the greater part of the work of the engine is done.

I show herewith a set of cards taken in this way from a Rhode Island passenger engine cylinder, 18-inch by 24-inch, with 64-inch drivers. It was tested between regular trips. The go-ahead blades were shortened a full sixteenth, and the back up blades one thirty-second of an inch when the cards were produced as shown.

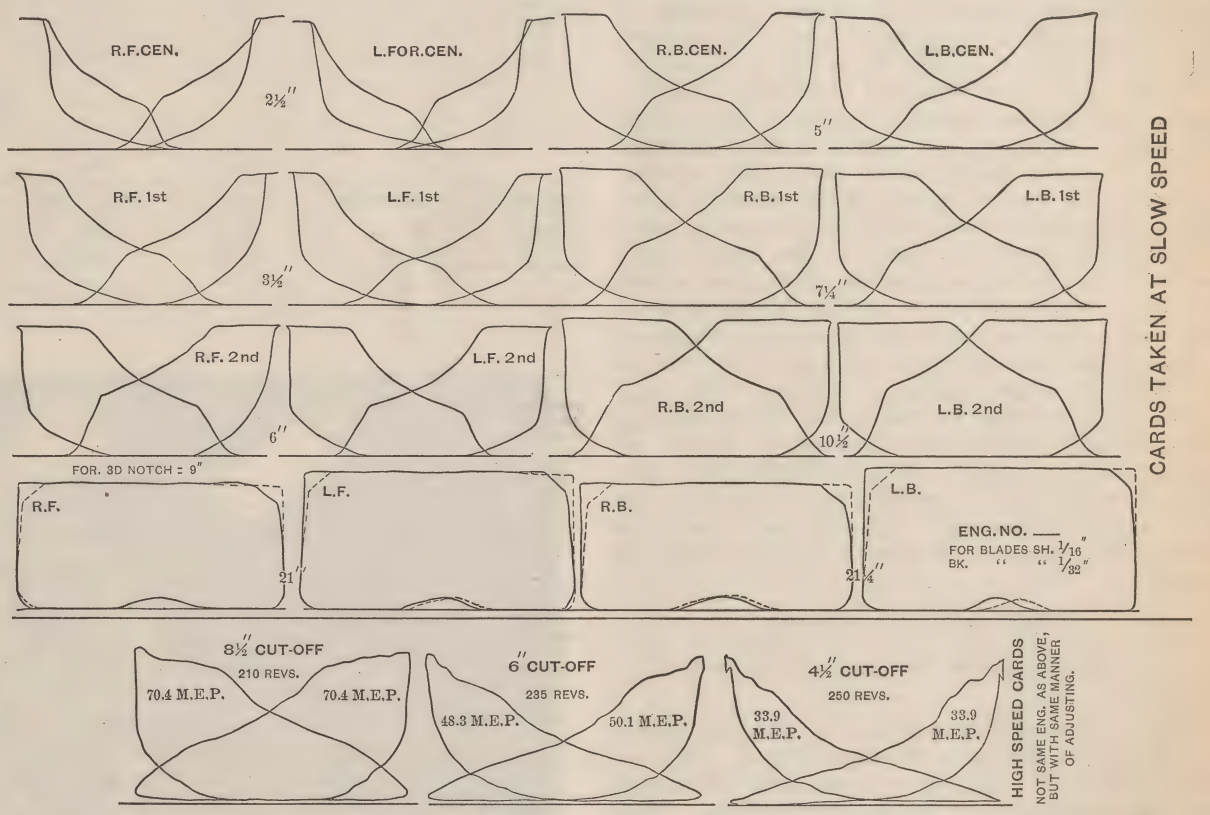
In order to prove this method of setting for correct distribution under speed, I offer three cards taken at considerable speed from a similar engine which was adjusted in the same manner.

It will be noted that the mean effective pressure is identical on each side of the piston in the card at 8½ inch cut-off, while in the other notches it varies but a trifle. I do not think that these cards show great excess of lead, but am not prepared to say as to whether we might not profit by a reduction from that now employed.

In the August number of the NATIONAL CAR AND LOCOMOTIVE BUILDER are given a number of cards from a 19-inch by 24-inch passenger engine. At $6\frac{7}{16}$ cut-off the admission corner of the diagrams are considerably rounded at speed from 200 to 288 revolutions per minute. There is no information given as to actual lead, but it must be considerably less than usually given to produce cards as shown.

I belive that it is generally held by old runners that lead is necessary to make an engine smart in starting a train from a station and that small lead or negative lead will make an engine lazy or slow to get under way. Supposing this to be true as regards the performance of the engine, I have the impression that it is not the addition of lead that makes them smarter, but it is due to the fact that by advancing the eccentric for lead, we also make the expansion period shorter and hasten the exhaust opening and thereby relieve the engine earlier of back pressure from exhaust, as with the late cut-off due to notches at or near the corner, the exhaust opening is very late and to fully clear the cylinder of back pressure from the large amount of steam used takes time. It will be well to carefully study whether it is best to sacrifice advantages in other directions to the desired smartness or attain it in some other way.

I shall expect criticism on my slow motion cards, but will say that for this operation I use the indicator only as a convenient tool in order to closely measure the cut-off in certain notches, and after having taken my set of cards can tell by a few simple measurements in what way it is necessary to make adjustments, and by this method can run an engine over quickly and frequently do the work while the engine is being tried after repairs. I have been indicating all engines passing through the shops now for some months and in the manner described, and will soon be in possession of information that may lead to recommendations toward modifying some of the proportions employed, and it is certain that the indicator is a most valuable instrument to get at some of the mysteries of steam distribution by the link motion.



Diagrams Taken at High and Low Speeds.

Business is so good on the "Big Four" that some of the engineers are said to be earning from $135 to $160, and conductors from $120 to $130 per month.

The Chicago, Burlington & Quincy will put on a new train from Chicago to Texas points commencing October 6, leaving at 1 p. m., connecting with the M., K. & T. at Hannibal, and arriving at Dallas on the evening of the next day, and at Houston on the following morning.

* Read to the Northwest Railway Club, Sept. 19.

Exhibit Car, Northern Pacific Railroad.

Most railroad men who visited the Columbian Exposition saw the interesting car full of exhibits of the productions of the Northwestern states shown by the Northern Pacific Railroad. We have reproduced the accompanying cuts, showing an exterior and interior view of the car, from the *Northwestern Magazine*.

The passenger and land departments of the road named have employed this means of giving the people in the states east of the Mississippi River an object lesson on the agricultural and mineral resources and possibilities of the states traversed by the Northern Pacific, namely, Minnesota, North Dakota, Montana, Washington, Oregon and Idaho, six of the most grandly productive States in the Union; not sterile and forbidding, but States blessed with a thousand natural advantages and possessing untold agricultural, horticultural and mineral wealth.

Exhibit Car, Northern Pacific Railroad.

The car is 72 feet in length over all, and 12 feet wide, and is made throughout of material furnished by the States named above. It is divided into compartments which contained the collections. The mineral and fossil exhibits are complete and interesting, the former comprising all kinds of ores, with a picture which shows the methods used in reducing and refining them. The principal feature of the exhibit now contained in the car is that illustrating the productive capacity of the soil. There is timothy eight feet high, with an eight-inch head, and stalks of oats six feet in height. North Dakota exhibits sweet corn as good for canning purposes as that raised in Maine, also buckwheat, wax beans, field pease and red-top grass. From Montana there are exhibits of flax, barley, wheat, black oats, and the wonderful alfalfa, which yields several crops of hay a year. Some of the fruit is canned on the stem, and presents a beautiful appearance. There are pears seven inches in diameter, silver prunes, peaches, and two bunches of grapes weighing 37 pounds. In the cereal exhibit is an interesting monument from North Dakota—successive layers of the kernels of wheat, rye, barley, oats and sweet corn. As will be seen in our interior view, specimens of the native wild animals of the Northwest are shown as near life-like as possible. The car is lined with pictures showing all the beauties of the Yellowstone falls and geysers.

Annual Report of the Wabash Railroad.

The annual report of this railroad for the year ending June 30 has just been issued in pamphlet form. This road now operates 2,601.7 miles of road, and has 418 locomotives, 321 passenger cars and 12,970 freight cars. Very little in the way of new rolling equipment was added during the last year. Two new engine tanks were built, also 52 new tender trucks and 44 new tender frames. Two combination passenger and baggage cars and 10 cabooses were purchased during the year, and one caboose, flat, furniture and cinder (dump) car each were built. The number of new wheels for passenger cars used during the year were 3,160, and for freight cars 6,894, a total of 10,054. Locomotive fuel cost the company $717,192.92.

The hospital association treated 21,071 cases, of which 2,046 were surgical cases. There were 17 deaths. As showing the widespread benefits of this association to Wabash employees, it is stated that 31,060 prescriptions were filled for employees not in hospitals. The operations of the hospital association for the year show a surplus of $4,030, and the excess of receipts over expenditures since June 1, 1884, when the service was inaugurated, to date is $35,257.

The following tables, taken from the General Manager's report, show the earnings and expenses in detail.

It will be noticed that the decrease in earnings, $591,609, is more than balanced by the decrease in expenses, $909,351. There was an increase in net earnings of $317,741. But a decrease of miscellaneous receipts and interest on bonds, and an increase in taxes and rentals made the result of the year's operations a deficit of $542,906.41, a large part of which is attributable to the strike of employees during the first half of the month of July, 1894, during which time the operations of the road were almost entirely suspended, while the expenses were only reduced by the wages forfeited by the striking force. It is roughly estimated that a net loss of from $300,000 to $400,000 resulted to the company. It is fair to assume that but for this unprovoked strike the company would have earned nearly the whole amount of its fixed charges. This result during a year of of unusual depression in railway traffic and low rates of transportation cannot be considered an unsatisfactory showing.

President Ashley in his report says:

"We enter the new fiscal year with substantial evidences of a larger and more profitable business, and, although the transportation interests will not derive any benefit from the corn crop until December, the revival of industry in every direction already contributes satisfactory gains to the revenues of the company. In this connection it is relevant to say that gratifying evidences of a better maintenance of established rates are visible in recent traffic returns. This proof of greater practical wisdom in the methods of conducting railway traffic, is a welcome sign of more harmonious co-operation in the handling of business, the volume of which cannot be increased by a senseless and ruinous competition. The change in the disposition of railway management in this respect, so far as developed, is a healthy and encouraging sign, as an indication of more prosperous conditions in the transportation interests of the country.

"The prospects of the corn crop, which is the most important factor in the freight traffic of the Wabash lines, are very satisfactory, and during the ensuing winter and spring should add materially to the business of the company. In this respect the Wabash will bear comparison with any Western line. If railway companies can be induced to maintain present rates the transportation of this important crop will compensate, to some extent, the losses incurred during the trying years through which the country has passed since 1892.

"The physical condition of the lines in the Wabash system continues excellent, although some important betterments have been temporarily suspended. It has been the policy of the management to preserve the condition of the tracks and motive power in the state of safety and efficiency hitherto maintained.

"It is gratifying to be able to express the satisfaction of the management with the employees now in the service of the company, including the trainmen, engineers and firemen, who replaced the strikers of July, 1894. To this entire force, as now constituted, the acknowledgments of the management are due."

EARNINGS.

	Per cent.	1894-95.	Per cent.	1893-94.	Increase.	Decrease.
Freight	66.33	$7,932,816.38	61.00	$7,656,891.81	$275,924.57	
Passenger	25.02	2,992,635.91	31.44	3,946,010.70		$953,374.79
Mails	3.45	412,819.72	3.32	416,290 53		3,470.81
Express	2.74	327,647 44	2.60	326,374.08	1,273.36	
Miscellaneous	2.46	293,919.67	1.64	205,881.80	88,037.87	
Total		$11,959,839.12		$12,551,448.92		$591,609.80

EXPENSES.

	Per cent.	1894-95.	Per cent.	1893-94.	Increase.	Decrease.
Conducting Transportation	43.01	$3,836,742.26	41.91	$4,119,195.42		$282,453.16
Motive power	28.00	2,497,559.51	25.72	2,528,508.48		30,948.97
Maintenance of way	16.41	1,464,215.80	19.30	1,897,410 83		433,195.03
Maintenance of cars	9.89	882,526 77	10.66	1,048,151.82		165,625.05
General expenses	2.69	239,985.39	2.41	237,114,42	$2,870.97	
Total		$8,921,029.73		$9,830,380.97		$909,351.24

Interior View, Northern Pacific Exhibit Car.

Annual Report of the Fitchburg Railroad.

The gross earnings of this road for the year ending June 30, were $7,237,723.99. The operating expenses were 68.68 per cent of this, amounting to $4,970,765.87. The net earnings were $2,266,958.12. Fuel for locomotives cost $708,222.17, and was the largest item of expense in conducting transportation, closely approaching that of maintenance of equipment $817,184.85, or of maintenance of way and structures $812,543.48. This road now operates 204 locomotives, 268 passenger cars and 5,818 freight cars.

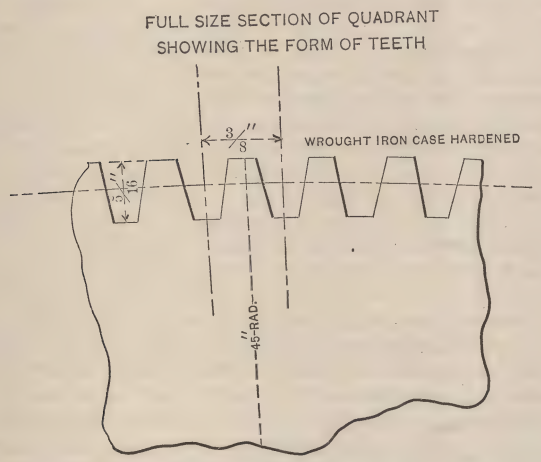
The report of President Marcy says:

"During the year there have been purchased or constructed 10 heavy locomotives and 13 passenger coaches, and provision has been made in the charge to expenses to replace 150 freight cars that have been destroyed or worn out with cars of 30-ton capacity; 492 freight cars have been equipped with vertical plane couplers and 241 with air-brakes, and 4,675 tons of 76-lb. steel rails and 266,412 ties were used in repairs. The work of replacing light bridges and reinforcing others so as to carry heavy rolling stock, which has been in progress for several years, and has called for a very large expenditure, has been completed, and heavy locomotives of 40 per cent. greater capacity are now in use on the Western division. The saving in working expense resulting from this is large and will be continuous."

The Illinois Central has orded 30 new locomotives. The Brooks Locomotive Works will build 18 of these, four being switch engines and 14 moguls. The Rogers Company will build two suburban engines and 10 moguls.

Improved Quadrant, L. S. & M. S. Railway.

We present herewith, through the kindness of Mr. George W. Stevens, Superintendent of Motive Power of the Lake Shore & Michigan Southern Railway, an engraving reproducing working drawings of an improved reverse-lever quadrant adopted as standard for the locomotives on that road. It is of the close notched type, and is supplanting the old style of quadrants with notches far apart. Mr. Stevens informs us that the improved quadrant costs only about a dollar more to make than the old style, and that while no figures have been collected to show the saving in coal effected by this improved means of regulating the cut-



off, yet it is certain that the increased cost "is trivial as compared with the advantages gained."

All threads on bolts in this arrangement are of the United States standard. All parts are finished except those noted, and all unfinished parts are made sufficiently smooth for painting and easy wiping. All of the body bound bolts taper $\frac{1}{16}$ inch in 12 inches. The pins A, B and C are potash hardened, as is also the metal around them, wherever practicable.

Referring to the lack of comparative figures mentioned, Mr. J. O. Bradeen, Master Mechanic of the road at Norwalk, O., says: "I hardly think, however, that the same would be necessary to convince locomotive men of its economy in comparison with other quadrants, inasmuch as it is apparent that any engine having one of them can be cut off close enough to allow of a full throttle being used, practically at all times when engine is working, which, of course, could not always be done with old style. No doubt you have seen enginemen who would make use of a railroad spike in quadrant notch when engine was hooked up to the one nearest center, that throttle might be used more open than notch referred to would allow."

Mr. W. O. Thompson, Road Foreman of Engines at Elkhart, Ind., says:

"I have never heard the matter discussed by any one that I remember now. But there must certainly be a difference in favor of the close-notched quadrant, as you will no doubt remember when you were running an engine that you were handicapped in your efforts to save coal, because you could not hook your lever back far enough to work a good full throttle when on a light descending grade, or level track."

The report of a committee of the Traveling Engineers Association on the influence of locomotive management on coal consumption, rendered to the recent convention, says:

"It is safe to say that even to-day not one engine in one hundred is in any wise arranged so that the engineer can handle his train with any degree of steadiness, or even retain steam pressure in boiler, by following the above. [Advice to use a full throttle while running.] The advice given was, on the whole, well meant, but it was many years in advance of the mechanical appliances to govern the admission of steam to cylinders, and it is plainly apparent even to-day that many of our railway mechanics and locomotive builders have given no thought whatever to the importance of providing means whereby the engineer could regulate the admission of steam to cylinders, and the best results obtained by providing closely-notched quadrants and a reverse lever that will make less noise than the whistle. Modern engines are found where, in dropping the lever from one notch to the next at the shorter points of cut-off, the cut-off is increased three inches, and the engineer is compelled, if he makes any showing at all, to lay a block of iron or a bolt across the quadrant in notch in front of lever to secure decent results."

The above gives no undeserved reproach to those who have carelessly neglected this matter. For the last four years the NATIONAL CAR AND LOCOMOTIVE BUILDER has been insisting on the need of this improvement as one of the most important necessary to enable the most economical results to be accomplished.*

* See pages 11, Jan. 1891, Effects of Throttling Steam; 87, June, 1892, Close-Notched Locomotive Quadrants (Standards Southern Pacific and C. B. & Q.); 92, June, 1892, Reverse-Lever Quadrants, editorial; 155, Oct., 1892, New Designs of Throttle and Quadrant, illustrated, Schenectady standard; 156, Oct., 1892, Improving Locomotive Details, editorial; 172, Nov., 1892, Economy of Close-Notched Quadrants, editorial; 175, Nov., 1892, Fuel Saving Effected by Close-Notched Quadrants; 108, July, 1892, Reverse-Lever Quadrants, editorial; 111, July, 1892, Reverse-Lever Quadrants; 52, April, 1893, Standard Reverse-Lever and Quadrant, C., R. I. & P., illustrated; 27, Feb., 1893, Union Pacific Standard Reverse-Lever and Quadrant, illustrated; 143, Sept., 1893, Baltimore & Ohio Standard Reverse-Lever and Quadrant, illustrated; 173, Nov., 1893, Pennsylvania Railroad Standard Reverse-Lever (Double-Latch), illustrated; 146, Sept., 1893, A Waste That Affects Net Earnings; 12, Jan., 1893, Advantages of Close-Notched Quadrants; 151, Oct., 1894, Improved Reverse-Lever Quadrant, Wabash Railroad, illustrated; 154, Oct., 1894, An Economical Device, editorial.

A Prosperous Outlook.

President C. P. Huntington, of the Southern Pacific, has just completed a trip from New York to San Francisco. He says the general condition of the country is much better than it has been for the last four or five years. "I look forward," he said, "to several years of prosperity. The railroads naturally are in a more flourishing condition, and the outlook for them is far better than it has been for several years. I think that the improvement this fall and winter will be very marked.

The earnings of the Chicago, Milwaukee & St. Paul Railway for the third week of September were $713,998; for the same period last year, $644,289; increase, $69,709.

Mr. R. R. Cable, president of the Chicago, Rock Island & Pacific Railroad Company, says that all roads west of Chicago will move more grain than ever next year.

The Birmingham, Sheffield & Tennessee River Railroad has been sold under foreclosure to satisfy a decree of the Knickerbocker Trust Company, of New York. J. Kennedy Tod and J. H. Leeper, of New York, bought it for the bondholders, bidding $500,000.

Until the present year the control of the stock of the Philadelphia & Reading Railroad Company has always been held in Philadelphia. Within the last six or seven months about 125,000 shares of the Philadelphia holdings have been sold to New York and London, and the control now lies in those two cities. Philadelphia parties held 500,000 shares of Reading stock last year, and this year they hold only 375,000 shares. New York holdings aggregate 275,000 shares and London holdings 150,000 shares.

Annual Report of the Denver & Rio Grande.

The ninth annual report of the Denver & Rio Grande Railroad, just issued in pamphlet form, shows a surplus over all charges of $528,690. The gross earnings over the previous year have increased by $440,796 and the net $422,-136, this being 16.86 per cent.

The company has marked down the value of its equipment $1,000,000. Arrangements have been made to buy the Santa Fe Southern Railroad, 38 miles long, at a small cash outlay. The total tonnage hauled was 1,992,764, against 1,739,253 tons in 1894. The number of passengers carried was 513,390.

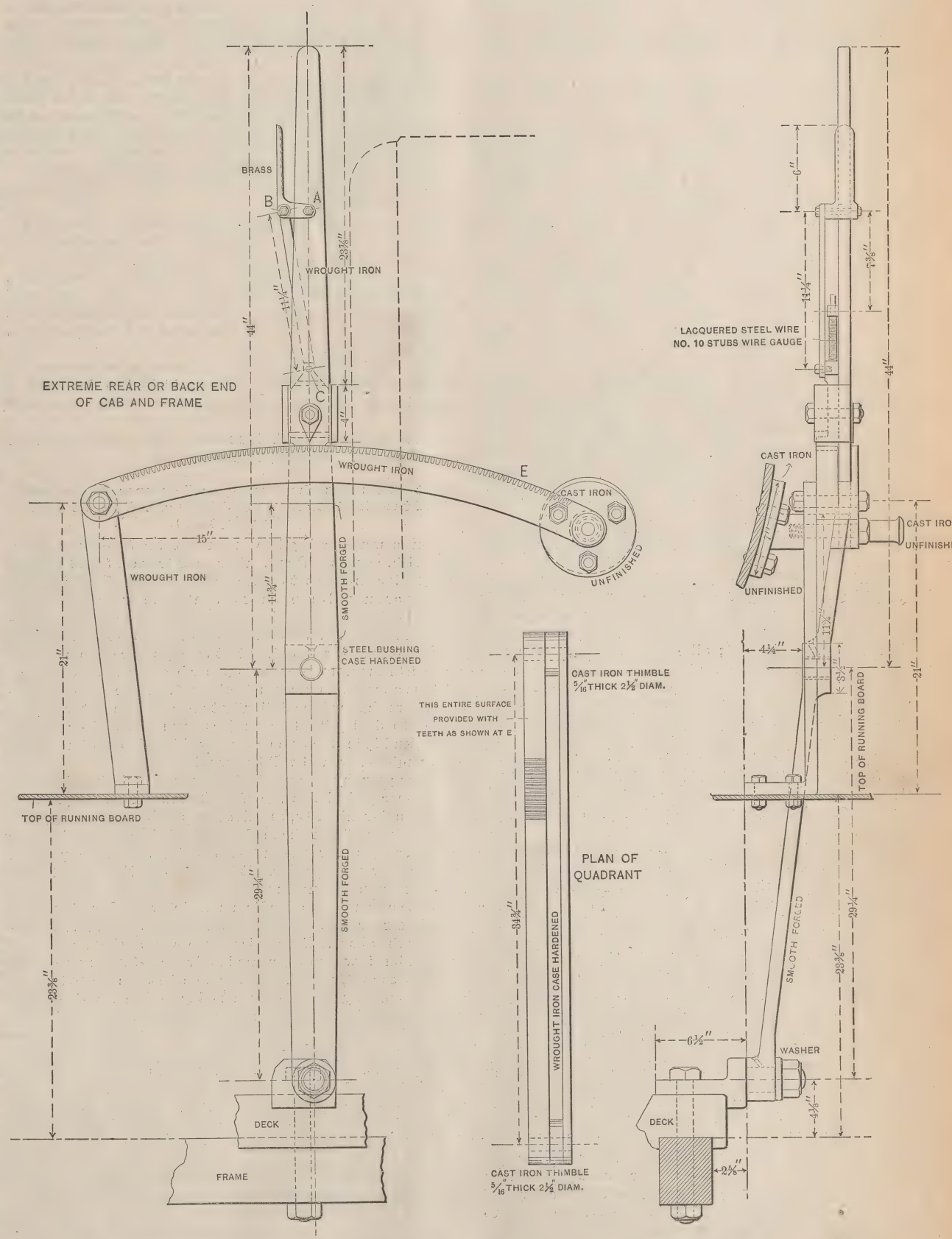
Incorporation papers will soon be filed in Denver for the Albuquerque, Colorado & Pacific Railroad.

An increase in earnings of $23,000 is reported by the Missouri Pacific Railroad for the third week in September.

Articles of incorporation have been filed in Lansing, Mich., by the Ann Arbor Railway Company, with a capital stock of $7,250,000.

A special meeting of the stockholders of the Illinois Central Railroad Company has been called for Nov. 26, in Chicago, to consider a proposition to increase the capital stock of the company from $50,000,000 to $60,000,000.

The Chittenango & White Sulphur Springs Railway Company has been formed with $150,000 capital. It will be constructed in Madison County, N. Y., and the directors are Charles F. Pennock, George C. Clark, Luke McHenry, William H. Young, Walter J. Roberts, Austin J. Roberts, John B. Dickinson, Henry C. Blackmar, Henry E. Parsons and J. Franklin Clark.



Standard Close Notched Reverse-Lever and Quadrant Lake Shore & Michigan Southern Railway.

The Traveling Engineers' Convention.

The third annual convention of the Traveling Engineers' Association, was held at Pittsburg beginning Sept. 10 and lasting until the 12th, the balance of the week was spent by the members in visiting the Galena Oil Works at Franklin, Pa., and the Pennsylvania Railroad shops at Altoona, Pa.

President C. B. Conger delivered an address at the opening of the convention in which he said:

"It is the understanding among railroad men generally that the Traveling Engineers are expected to keep up with the progress of locomotive improvement, and in that way be able to keep the enginemen with whom they are associated also posted in all the best methods of handling the machinery. As the Traveling Engineer is expected to be an educator, he of course should know how the work should be done, in order to show anyone else how. Therefore our officers will naturally have confidence in our ability to be of service to the companies, and the employees respect us for the correct knowledge of railroad operations we possess in a direct ratio to the interest we take in carrying out the motto of our Association: 'To improve the locomotive engine service of American railroads.'

"In regard to the attendance at our annual meetings; it has been very good, but to get the full benefit of a membership in the association we should attend personally, not wait to find out what was done by reading the report. While the report is valuable as a record of the business transacted during the meeting, and contains the commtttee reports in full and discussions thereon, yet a very valuable part of our meetings is the comparisons of individual experiences, these facts are lost to those who do not attend the meetings, even if our reports are made as full as possible. Therefore, you will find it to the advantage of one and all to attend, take account of all information, and our report will record what you heard at the session and refresh your memory in a future reference. In this connection we might again speak of the advantage it is to members to take an active interest in committee work. No matter whether or not you are particularly interested in the special subject to which you are assigned, yet the information collected on that question will give you several new ideas on the matter and displace several old ones. If it is a new subject to a committeeman, it broadens his views and extends his field of information."

The President admonished the members that they "may find it necessary before long to begin to post up in the operating of electric motors in all their particulars as well as we are now skilled in operating steam locomotives." The election of officers resulted as follows: President, C. B. Conger, Grand Rapids, Mich., with the C. & W. M. and D. L. & N.; First Vice-President, R. D. Davis, Chicago, Ill., with the Illinois Central; Second Vice-President, G. H. Brown, Dubuque, Ia.; Master Mechanic of the Chicago, Milwaukee & St. Paul; Treasurer, D. R. McBain, Jackson, Mich., with the Michigan Central; Secretary, W. O. Thompson, Elkhart, Ind., with the Lake Shore & Michigan Southern. The next convention will be held in Minneapolis.

The committee on the subject, "In what manner can a close record be kept of condition of engine, amount of work performed and manner of doing it, together with manner in which work is done by engineer and fireman, which will serve as record of character and qualification for advancement of men," recommended the adoption of the form of report printed on page 117 of the NATIONAL CAR AND LOCOMOTIVE BUILDER for August, 1895.

How Can the Traveling Engineer Assist in Preventing the Unnecessary Emission of Black Smoke?

To the circular letter but twenty-two replies were received, ten of which report in favor of smoke consumers; all report in favor of straight stack and extension front; all report in favor of brick arch; all report in favor of hard class of coal; ten in favor of wetting coal; all say the engineer can assist the fireman in the prevention of smoke; all say the smoke nuisance can be brought to a minimum without the use of consumer; six report that they use the steam jet consumer; twenty-one report good results from use of brick arch, and one no experience; thirteen report in favor of baffle plate inside fire-box door; all agree that no appliance will avail much without it be in the hands of intelligent and skillful men; six report bad results from double-crew or pooling; six can see no difference; ten had no experience in double-crewing or pooling.

Your committee on the above question beg leave to say further that the traveling engineer should be thoroughly conversant with the principles of combustion, or at least he must be a good practical fireman. If he is not this, his instructions to his men will not be productive of much good. He should be capable of taking the shovel and demonstrating that what he preaches can be practiced. The old idea that the "fog must roll" if you expect the steam is a false one. There is a substantial percentage of the firmen who realize this, and who know that more satisfactory results are possible by a little more liberal use of the brain and less of muscles. The traveling engineer should encourage that class of men, and instruct those who are otherwise. The traveling engineer should as far as his authority permits see that the coal is broken to a maximum of 3 inches, on the coal dock if possible, but on the engine if necessary. This should be done by men on coal dock. The fireman can more profitably apply his attention to his fire, which is very necessary where the consumption of smoke is an object. The traveling engineer should also see that the grate openings are kept clear and flues bored out when necessary. We will make no effort to say what kind of coal should be used, but will try and point out how the best results can be obtained with the devices and material at hand.

This report of course applies to bituminous coal only, as we have yet to hear of anthracite coal causing trouble by smoke. The enginemen must be intelligent, skillful and conscientious. The engineer must work with his fireman, and the fireman with his engineer. Without this unity of action results will not be as they should. The engineer should give his firemen all the advantage that is consistent with the proper handling of his train—such as shutting off injector when pulling out of stations, so that it will not be necessary to force the fire, or if the steam drops back he should shut his injector off just long enough to regain the maximum pressure. He should also be careful in pulling out not to break the fire more than is necessary by allowing the engine to slip, or working engine to excess as the speed increases. The fireman should, after he has a good (heavy) bright fire, maintain the same by adding one or two scoops at a fire, being careful not to cover all the grate surface when fresh coal is added. At best one-half of the grate surface should be left bright, so that the smoke and gasses from the freshly added coal will come in contact with the clear white blaze and be consumed. In our opinion when the service is heavy the coal should be added as often as necessary, in the following manner: One scoopful right back corner, one in the left front corner and the next fire vice versa, and so on. However, when the service is light, more than one scoopful at a fire should not be put in, making that cover one-quarter of the grate surface each time. If an engine is fired in this way there will be a little smoke, but not a dense black volume, and when an engine that is being fired in this way is shut off the door should be partly opened and the blower applied so as to admit air over top of fire. The traveling engineer should see that the scientific firemen are recognized, and also that the unscientific ones, if they cannot be brought up to the proper standard, after they have been properly instructed, be retired to some other kind of firing—gas house preferred. The engineer, if he be one of the old-time knockers, should be made to understand that his success depends on the showing he can make, not upon his years of service. If the traveling engineer will persevere in bringing about the above very much needed unity of action, he will do a great service in abating the smoke nuisance on American locomotives.

We consider the brick arch one of the greatest aids to the engineman in the prevention of smoke, inasmuch as the smoke and gases to a great extent are consumed in coming in contact with it, which in its absence would escape through the flues.

We consider a good solid fire the best, i. e., about six to eight inches good white fire, then when fresh coal is added there will be more heat units to ignite the smoke and gases than there would be if a light fire was carried, and there will be less likelihood of the air coming through the grates in too great volume. And further, because if the service is heavy the heavy fire will stand the action of the exhaust better than a light one.

We recommend the wetting of the coal when weather will permit of it, as the vapor arising from the coal when put in the fire will materially assist in the consumption of smoke.

We consider the baffle plate over the door of great value, inasmuch as the cold air that enters at the door when open will be turned downward onto the surface of the fire, a great percentage of which, in the absence of the plate, will pass direct to the flues.

In cities where a little smoke is annoying, we recommend the use of a good smoke consumer, which, if in the hands of careful men, will do good work and prevent the emission of smoke.

D. R. MCBAIN, N. S. MOORE, C. M. BRINSLEY, C. F. SCHRAAG, A. M. BICKEL, Committee.

What Effect Has the Proper or Improper Manipulation of the Throttle, Cut-off and Boiler Feed on the Coal Consumption?

Your committee beg leave to submit the following: To begin with, your chairman, after long travail, found himself utterly incompetent to formulate a series of questions of such as are usually sent out to members in order to elicit the desired information bearing on any subject under consideration, and at last, in despair, he appealed to your president that he might be allowed, with the assistance of his fellow committeemen, to prepare a paper bearing on this subject, and his appeal was graciously allowed. There is no one better aware than we the difficulty that would be met were this paper to deal with this subject from a know-it-all standpoint, and indeed no such course will be adopted, but rather a safe middle ground will be occupied.

A few years ago it was the fashion of a majority of writers in the mechanical press, or, if not the majority, they formed a very noisy minority, to advocate and even demand that locomotive engineers be made to, at all times when hauling a train, use the throttle full open and govern the speed of the train by reverse lever. It is safe to say that even to-day not one engine in one hundred is in any wise arranged so that the engineer can handle his train with any degree of steadiness, or even retain steam pressure in boiler, by following the above. The advice given was on the whole well meant, but it was many years in advance of the mechanical appliances to govern the admission of steam to cylinders, and it is plainly apparent even to-day that many of our railway mechanics and locomotive builders have given no thought whatever to the importance of providing means whereby the engineer could regulate the admission of steam to cylinders, and the best results obtained by providing closely-notched quadrants and a reverse lever that will make less noise than the whistle. Modern engines are found where in dropping the lever from one notch to the next at the shorter points of cut-off the cut-off is increased 3 inches, and the engineer is compelled, if he makes any showing at all, to lay a block of iron or a bolt across the quadrant in notch in front of lever to secure decent results. We will here quote from a letter from one of your committee: "I should not feel like recommending anything less than full throttle, with a cut-off of 25 per cent. of stroke, when speed and work will admit of it. In order to satisfy myself I made what might be called a crude test, covering a period of 40 trips, a division of 120 miles, with a passenger train of 5½ cars. In order to equalize matters for late trains, high winds, etc., I worked the engine full throttle one round trip and the next round trip never hooked lever back of 8 inch notch, reducing work by wire drawing steam with throttle. While I could not check against possible errors I learned sufficient to show me that the difference between the two methods was not nearly as great as I had previously believed, the slight difference being in favor of the full throttle method."

The foregoing will be a fair sample of the testimony of nearly all. In this case we have more power than was generally needed, and wire-drawing of steam followed. It would have been interesting to know what the actual cut-off was where he was enabled to use the full throttle. The golden mean of the cut-off of steam is at that point where the desired speed of train is most easily had; where the engine is not plainly laboring against itself; where, if in case of freight trains, sufficient admission of steam is used to maintain an easy motion of train on grades, and not stagger as though about to stall every moment. And, above all, this question of what shall the position of the throttle and lever be under various conditions, can be safely left to the intelligent handling of our locomotive engineers, being assured if we give them good means of adjusting them and keep them posted on results, with fair treatment, they will not fail to do their part.

The second part of this subject is not so easily disposed of. It is undoubtedly true that on boiler feed depends a great share of the economy with which the locomotive may be operated. It would hardly cut any figure how careful an engineer might be in the handling of his train with the skill he used in regulating speed, in the adjustment of the throttle and the reverse lever, if with all other merits he was not, as is usually termed, "a good pumper"; if the water required was not put into the boiler at the right time and the right place. With our modern locomotives, with much steam and water space, there is great opportunity for accumulating water in reserve of its requirements. Often a train may pull out of a station and proceed several miles upon its journey—this depending on the weight of the train, the speed and grades—before it is necessary to put additional water into the boiler. With the older class of engines, with very small boilers, this is not possible. It is the concensus of opinion that when an engine is in the act of pulling train out of station it is not advisable to force water into the boiler, unless it be actually necessary; that good results are had and immunity from leakage by not starting water feed until the train has gained some headway, and the fire is burning clear and strong upon the grates and engine is making steam freely. The observant and careful engineer will take every possible means to utilize the steam that would otherwise go to waste through the pop valves, by using it in putting as much additional water into the boiler as it may carry without danger of working water over the steam valves. He will so regulate his water feed on approaching stations that when steam is shut off he will not be compelled to shut off feed water also, thus preventing loss of heat through steam wasted at safety valves. The careful engineer will not keep injector working when steam pressure is failing, if it can be avoided, as it is well known that oftentimes if the injector be shut off for even a short distance, where steam is failing, it will enable the fireman to so handle his fire, where it may have been damaged by poor coal or clinkered on the grates, that he can maintain a full and regular pressure thereafter, and the little water lost is easily regained.

Your committee would strongly urge upon all the importance of carefully watching this matter with the engineers with whom they are brought in contact, and in our experience we have known almost remarkable results to be brought about in an engine's fuel performance, by explaining this matter to engineers who had not perhaps given it the thought that the subject deserves.

GEO. H. BROWN, C. P. CASS, WALDO H. MARSHALL, P. J. CARNEY, JNO. A. HILL, Committee.

Fuel and Water Supply.

The committee on "Could not the locomotive service of the country be improved if the furnishing of feed-water and coal was in the hands of the locomotive department?" reported that the answers to its circular of inquiry indicated that the transportation department of most railroads supervised the fuel supply of locomotives. On some roads efforts are made to keep the kind of coal used uniform on the respective divisions, and on others no such efforts are made. The nearly unanimous expression of replies declared that such efforts would be advantageous.

In reference to the question: "Do you consider that it would tend to economy and improved service if your fuel supply was under the supervision of your mechanical department chief?" Thirteen of the 17 replies said yes: "On account of the Superintendent of Machinery being better able to judge as to the requirements and of the results obtained by the use of different coal; four answered no, on account of the mechanical department officers already having too much on their hands." All answers expressed the opinion, however, that the head of the mechanical department should be consulted in reference to the quality of coal furnished, but this is done, according to these answers, only on about half of the railroads.

It is evidently general practice for the transportation department officers to have control of the locomotive water supply, as of the 17 replies 15 so reported. The members replying were about evenly divided as to the advisability of placing the control of water supply under the mechanical superintendent. On about half the roads this official is not now consulted in reference to the matter. Eleven roads answering the circular analyze the feed water, and six do not. In answer to the question: "What is the life of flues in your best and worst feed water?" 17 answered from one to three and one-half years. One answered 12

years and not leaking yet. General average, two years and eight months.

One member, a master mechanic, wrote as follows to the committee in reference to the fuel supply :

" There is probably no department of a railroad so subject to vexation and trouble as is the fuel supply, not only on account of the constantly varying quality furnished from different mines, but on account of labor troubles and the absolute difficulty at times of procuring an adequate supply of any kind of coal and with the many duties now performed by the officials of the mechanical department, which on most roads now means the care of all rolling stock, I think a better plan is for it to be handled by the fuel department or by the operating department."

An English member wrote :

" On English lines the locomotive fuel supply is under control of the locomotive superintendent. The colliery companies send in tenders for a particular quality of coal and every wagon load they send is examined by an inspector on behalf of the locomotive superintendent. Some of the various qualities of coal are carefully tested, both in practice and by the experts in the testing department; there is, therefore, no fear of any person supplying bad coal to the companies. In reply to question 6, I believe that the coal supply, both as to quality, quantity and districting the supply, should be under the control of the locomotive superintendent or chief of the mechanical department."

The committee recommended that from whatever source coal is furnished the mechanical department should be consulted with reference to the quality, it frequently happening that a much better grade of coal can be procured at a very slight advance in price ; and it should also be consulted with reference to the assigning of certain kinds of coal to certain districts, with a view of adapting all draft appliances within such district to suit the coal furnished.

In reference to the water supply, Mr. Stretton, an English member, wrote that the water they use is filtered, and is the same as the people drink. It is analyzed by the companies, from time to time, and where there is no water company the railroad companies make wells and provide pumping engines of their own, but they do not make such wells till they have proved that the water is good. Water tanks, water cranes and the supply of water for engines is in England under the locomotive superintendent. He also states that there is but little trouble as to the life of flues in engines, for as soon as the locomotive superintendent finds that the water at any place is not good he takes steps to obtain a supply from some other source.

A Western master mechanic wrote :

"The water question appeals with particular force to lines west of the Mississippi, and to all lines running through bad water districts. It is a fact, too well known to all mechanical department people, that a great amount of indifference exists on the part of managers of railroads to this water question, and it appears to those who have given the matter much reflection, that they have contented themselves by simply furnishing us with that substance represented in chemistry by the symbol H^2O, with little or no regard to quality, a point of the most far-reaching significance. In fact it seems that they have contented themselves to know that the water furnished us was wet. Our experience in this direction on this system may fairly be said to be typical of the experience of others on the different railroads. If stockholders were aware of the economies to be effected by a thorough scrutiny and supervision of the water and fuel question, railroad managers, in self-defense, would hasten to the front in the effecting of measures to utilize every advantage available.

" The advantages of a pure water supply are of a very far-reaching nature. In fact they may be said to ramify in every direction in which steam may be used to further the ends of commerce. I have sometimes thought that railroad managers, by virtue of their offices, should be members of these technical bodies which contribute their time and means to furthering and developing those practical features which underlie all success in railroad operation. Especially would it be well if they attended the sessions of the Master Mechanics' Association, and heard discussed from time to time the various issues that evolution and progress bring before the mechanical eyes of the railroad world.

" Comparison of the performances of locomotives in good and bad water districts, I should judge, would be a strong incentive to railroad managers to see that the very best water obtainable was furnished to their engines. We have some sections of this country where flues run for five and six years as easily as they do as many months on several divisions of this system. Not a great deal of reflection is required on this simple illustration to consider how serious the discrepancy. It is a well understood fact that in some sections of this country flues will run more years than they will months in others. The rapid deterioration of boilers in bad water districts is one of the gravest problems that concerns motive power officials. It is the hidden enemy that lurks craftily, and to a great extent invisibly, in the wake of the mechanical department official, aud oppresses him with the knowledge that, let him do his duty never so well, he is playing a losing game, and must in the end consider himself vanquished.

" Those who have handled locomotives under such conditions understand that the agency that renders flues so quickly unserviceable was no less diligent in its destructive efforts on the remainder of the boiler, producing leaky stay and crown bolts, because of the greater quantity of incrusting solids that accumulate in the angle formed by the stay or crown bolt with the sheet ; and taking advantage of any lack of painstaking thoroughness on the part of the boiler washer, by filling up points in the water spaces that are difficult to reach and keep open, producing cracking and mud-burning of the sheets at such points. There is about as much difference in the handling of locomotives in conditions like the above, and those where good feed water obtain, as we would expect between paradise and perdition, crediting those places with all the attributes usually assigned by the orthodox, and not losing sight of the thermal properties of the latter.

" Observation has led me to the conclusion that a great deal of trouble and expense incident to the operation of boilers using bad feed water, might be avoided by in the first place selecting water for such purposes as had been passed upon by those competent to determine its fitness, and who had direct interest in seeing that it was the best possible to be obtained. This proposition doubtless seems so simple as to be wondered at, but when we understand that the mechanical department among railroads is not consulted in the location of water tanks, and further that the damage to boilers and detriment to the service resulting from the use of impure water is a matter that appeals directly to, and is in the nature of things best understood by that department, we can see where the idea assumes proportions slightly more pertinent. You no doubt have seen, so have other men who have kept their eyes open, the vile kind of water given to engines, year after year, from wells whose waters were notorious as scale producers, with little or no effort to improve the condition of things. The complaints of mechanical department officials for a betterment in this direction have met with various replies in offset, many of them stereotyped. ' No funds ' is a very common reason alleged, although the funds go year after year to retain an army of boiler makers to repair the ravages made by this bad water on the boilers of the several railroad systems, and no permanent advantage results. On this division alone I reset over ten thousand flues last year, notwithstanding the dullness of the times and reduced force. This should more than suffice for the entire system if we had half as good water supply as some roads are blessed with. That good water can be obtained at all points on the system is something of course that cannot be said without due investigation, but considering the great importance of the subject, it is certainly worth investigating, and we will never know what can be had until we do investigate."

The report concludes as follows :

Your committee believes that in furnishing feed water to boilers the interests of railroad companies could be best conserved by having the handling of same in mechanical department, or at least the head of the mechanical department should be consulted with reference to the quality of water furnished, and where water is not suitable means should be at hand for its betterment. One of the great losses entailed by railroad companies is caused by the use of bad feed water, not only to the deterioration of boilers, but also on account of loss of power, increased fuel consumption and delay to traffic.

W. R. SCOTT, GEORE GREGORY, J. N. BARR, S. W. SIMONDS, D. MEADOWS, Committee.

Airbrake Instruction.

The committee on " When traveling engineers are also airbrake instructors, how can they best instruct and examine the enginemen and trainmen without the use of an airbrake instruction car or instruction room ?" concluded its report with the suggestion that, on starting out, there should be a thorough understanding all round as to the duties and authority of the instructor. An instructor should be capable and ready to do whatever he requires of his pupils. Thorough examinations are of paramount importance. The committee recommends for the examination of engineers and firemen the list of air-brake questions proposed on pages 133 to 136 of the annual report of last year; while for train crews the following list of questions now used by one member is proposed :

When coupling an engine to an airbrake car that is charged with air, which angle cock should be opened first ?

When coupling two airbrake cars together how should the angle cocks be opened to avoid setting the brake with emergency ?

Please describe the position of the handles to all valves and cocks in airbrake equipment on cars, when opened and when shut ?

Do you understand that all airbrake cars in a train should be connected and train pipe charged with air whether brakes are set or not ?

After coupling an engine to an airbrake car or train, that is not charged with air, how long do you wait before testing the brake ?

Why is it necessary to wait ?

Where is it necessary to test the brake ? Name all places.

How is this done ? At each place ?

Would you consider a train safe to leave with, if the brake had been tested by opening tail hose on last car, if no other test had been made ?

What is the proper piston travel ?

How do you adjust for that length ?

If piston travel is too long or too short what effect does it have on the brake as to its holding power ?

If a brake is broken or disabled on a car what should you do ?

Must a brake be released before cutting it out ?

If a plain triple brake sets tight when you are charging the reservoir with air, should you cut out that brake or can it be remedied ?

If air blows out strong at the exhaust port of quick action triple valve, or at the pressure retainer, would you cut out that brake ?

What effect does a leak in train pipe or hose have on the operation of the brake ? When set by engine ? When car is cut off from engine ?

If a train pipe is broken on any car what should be done ?

What should be done in case of a burst hose ? How is it located ?

What should be done in case the train breaks in two ?

When and how should conductor's valve be operated ?

How does the pressure retainer operate ?

If the pressure retainer breaks off can the brake be used on that car ?

If the air leaks and comes out of pressure retainer steadily, should it be closed or left open ?

With a freight train partially equipped with air, under what circumstances would you set hand breaks on rear cars of train ?

If hand brakes are used on such a train, on what cars should they be used ?

On an airbrake passenger train, in case engineer whistles for brakes, what is your duty ?

How can the air signal be operated most sucessfully ?

How long between blasts from car discharge valve ?

Why must all hose couplings be hung up when not in use?

The Art of Air-Braking.

Under the subject of "The Art of Air-Braking from an Engineer's Standpoint," the duties and responsibilities of locomotive engineers are both extensive and varied. We will, therefore, not attempt to analyze nor discuss in full all branches incident thereto, but will confine ourselves to the more important every day duties involved.

The foremost factor leading to a successful issue is competency on the part of the engineer. By this we do not wish to convey the idea that he must be an expert in all matters pertaining to structural details (though such acquirements are very desirable), but he must have a comprehensive knowledge of the rudimentary functions performed by each piece of mechanism connected with the air-brake and signal apparatus on both engines and cars, in order that he may be able to counteract the numerous and various obstacles arising on the road as far as possible, thereby avoiding causes for accidents and delays, and also be able to make intelligent reports for repairs actually needed, on arrival at repair points, instead of making the not infrequent mistake of reporting "air-pump no good," when the air pressure could not be maintained owing to severe leakages on engine or cars, thus causing a great deal of both time and expense to be wasted searching for imaginary defects, or defects existing in some remote part of the apparatus.

The engineer should be familiar with, and held responsible for, the care and condition of the air-brake and signal equipments on engines and tenders, even though inspectors are employed, to the following extent, viz.: That the air-pump works freely and does not blow at steam end ; that air valves in pump act promptly at both ends and are free from gum, etc.; that packing at both steam and air end is not leaking; that air-pump governors act promptly, and allow the pump to maintain the standard air pressure; and open full head of steam to pump with not more than three pounds reduction of air. That brake and equalizing discharge valve is sensitive and free from leaks, and when handle of same works hard or stiff under normal conditions, and indicates a dry or grinding sensation, that it must be cleaned and lubricated, and if he performs this work himself that the valve seat and equalizing piston are lubricated with the proper lubricant.

The steam cylinder of an air-pump requires a constant but sparing supply of good cylinder oil (quantity varying with the speed of pump), and for air cylinder not more than one teaspoonful of light mineral oil should be used at each oiling, which should be done while the cylinder is cold, either before or immediately after the air-pump is started. The oil should always be introduced to top side of piston, in order that it may be properly distributed over walls of cylinder and packing rings. When driver brake cylinders are so located as to become heated from the boiler, they should be oiled at least once each month, except when cylinder grease is used, and piston in horizontal cylinders turned half over after each oiling, to convey oil to top side of cylinder.

Over-heating of air-pump and the burning out of packing in same are due to the following causes, viz.: leaks in brakes on engines or train, not sufficient lift of air valves in pumps or valves and passages choked up in pump and discharge pipe, due to too much or improper quality of oil used, high speed of pump, an unnecessarily high pressure carried, or packing leaking in pump. Draining of main reservoir and other lodging basins for moisture is an important item and should be attended to at proper intervals.

HANDLING PASSENGER TRAINS.

Before attaching the engine to the train, the air-pump should be started and lubricated, with maximum of air pressure accumulated in main reservoir, that no delays occur in charging brakes fully before testing same. When testing the brakes on train, the engineer should reduce full 20 pounds in service position and leave brakes applied until signaled to release. It has been suggested, in making tests as above, to make the 20-pound reduction in three or four installments, to better represent an ordinary stop. To this we would say that we can hardly see any practical gain from such practice at this time, except that it would show the power of gradution of the brakes. As an additional precaution in passenger service, the running tests should be used on leaving terminal points, and whenever any portion of the train has been detached or added to.

If approaching stopping point at a high rate of speed, two applications (not more) may be considered good judgment, using a strong application to reduce speed of train, then making final stop with light application, owing to the fact that wheels are more liable to slide at a low than under a high rate of speed. When sand is used in making stops, the greatest care must be exercised on " slippery " track, that wheels do not slide before sand is running. The safe method is to let sand run a full train length before making application of brakes, and continue to use sand until stop is made. Another method that may do as well with due care is to apply brakes lightly, not to exceed eight pounds reduction, then sand the track a full train length before further reduction, and let sand run until stop is made. Always release brake on passenger trains one to three revolutions of drivers before coming to a stop, to avoid the lunge of cars, caused by the manner of supporting brake beams, causing trucks to incline or tilt forward when brakes are applied with any degree of force. This effect is also augmented, to some extent, by the retarding force of brake on the trucks resisting the momentum of car body.

Emergency use of brakes, as the term denotes, should only be resorted to when actual cases unexpectedly arise, in which case the engineer should place his brake valve to full emergency position and leave it so until train has been stopped, or the immediate demand for stopping it has passed. The practice under the above conditions of returning the valve to lap position, before all the train-pipe pressure has exhausted, would be considered favorable, if assurance were had that all brakes in the train were of the quick-action type and in first-class condition, as to being free from leakages, etc., but unfortunately this is not always the case, hence our recommendation as above. The practice of resorting to the emergency, when making accurate stops, as for water tanks, etc., is strongly condemned, as it creates severe and undue shocks to the train, and is an indication of incompetency on the part of the engineer. Reversing the engine under the above conditions should be as strongly discouraged, and is considered the worst of practice in passenger service.

In freight service, as in passenger, it requires the same preparation before attaching the engine to the train, testing of brakes, etc., but it remains a fact that freight trains must be handled with a great deal more care and delicacy, owing to their increased length, amount of slack, more subject to leakages, and most frequently only fractionally equipped with air-brakes.

That air-pumps may be not ever taxed, rigid economy should be practiced in the number of applications made for each stop. By applications we do not mean reductions. A series of reductions constitutes one application, when brakes are again released. One application is good, two are a great many, three or more are a waste of air and handle the train roughly, besides a tendency for the brakes to stick, owing to the reserve pressure being used up in the early stages of operations.

(To be continued.)

NATIONAL CAR AND LOCOMOTIVE BUILDER

ESTABLISHED IN 1870.
PUBLISHED MONTHLY
BY
R. M. VAN ARSDALE,
MORSE BUILDING.....NEW YORK.

GEORGE H. BAKER, Editor.

HERBERT W. POOL, Business Manager.

OCTOBER, 1895.

Subscription.—*$2.00 a year for the United States and Canada; $2.50 a year to Foreign Countries embraced in the Universal Postal Union.*

EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING PAGES. *The reading pages will contain only such matter as we consider of interest to our readers.*

Special Notice.—*As the* NATIONAL CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, correspondence, advertisements, etc., intended for insertion must be received not later than the 25th day of each month.*

Contributions.—*Articles relating to railway rolling stock construction and management and kindred topics, by those who are practically acquainted with these subjects, are specially desired. Also early notices of official changes, and additions of new equipment for the road or the shop, by purchase or construction.*

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VALVE LEAD.

The article on Lead for Locomotives, by Mr. C. A. Seley, appearing on another page of this issue, is the first appearance in print of Mr. Seley's paper on this subject, read to the Northwest Railroad Club at its last meeting. The paper was inspired by the article published in our last issue on the same subject written by Mr. C. H. Quereau. We are glad to see that Mr. Quereau's advocacy of reduced lead for locomotive valves (as compared with general practice) strike a responsive cord in the wideawake Northwest, and it is certainly a hopeful sign of progress in the improvement of locomotive details of great importance to their economic and efficient operation. Mr. Quereau declared and offered some good evidence to prove that too great lead at the usual running cut-off is a common fault with the majority of American locomotives. Mr. Seley practically endorses this, and shows with what rapidity the actions of admitted steam take place in the cylinders of fast running locomotives. He says that in a case cited by Mr. Quereau the probable total pressure imparted to the pistons at the beginning of strokes was over 35,000 pounds in one-sixteenth of a second. Any interference with the natural action of high pressure steam during such rapid performances may result disasterously to the engine, owing to the severity of the shocks produced. Excessive lead y result in momentary pressure at the end of strokes far above boiler pressure, "as the time may be too short for the current of incoming steam to reverse in direction of motion." Mr. Quereau mentioned several cases where loosened cylinders, broken deck bolts and piston rods, and hot pins resulted from excessive lead, the proof being that the trouble was cured in each case simply by a reduction of lead. Both gentlemen observe that probably one potent cause of engineers being generally inclined to run with light throttle and a later cut-off than is economical is the jarring while running fast produced by excessive lead. We commend to our readers a careful perusal of Mr. Seley's article, and of Mr. Quereau's article also, to those who have not yet read it. Indeed, the matters they treat of are of such economic importance, and the reputation of the writers for intelligence and practicle common-sense is so good, that their merit demands not only perusal but careful study.

RELATIONSHIP TIES.

We are glad to publish on another page a letter from the Third Vice-President of the Southern Railway denying the report published in our August issue and commented on in our last issue to the effect that he had issued an order directing the heads of departments on that road to discharge or transfer all men in their respective departments who are related to themselves either by blood or marriage. In commenting on the principles involved in such an action, we said that there could be no question but that the order was calculated to discourage favoritism and promote justice and fair dealings between officers and subordinates, but that as the "relative" might be competent and enjoying no unearned advantage a compulsory change was likely to do him an injustice; and that in cases of snch evident favoritism the officer should be changed instead. We are pleased to note that Mr. Baldwin is of like opinion and has acted in accordance with it.

While in the ordinary affairs of life it is proper that the ties of relationship should be influential for preference, no greater folly can be practiced than to give them any consideration in business, especially in railroad service where the conditions necessarily impose a high degree of discipline among thousands of employees, no one of whom may properly or safely be favored above another, except solely for loyalty and efficiency in serving the company's interests.

THE LONGEST LOCOMOTIVE RUN.

A correspondent in London has sent us the following announcement of a long distance run by a locomotive which has been published in several English papers:

"The longest continuous run of a locomotive was accomplished by a Webb compound engine, the *Ionic*, on the London & North Western Railway, Sept. 8. In the recent races between London and Aberdeen the trains on this road stopped at Crewe to change engines, losing three minutes by stoppage and about two minutes more in stopping and starting. On the date named the unparalleled feat of running from Euston to Carlisle, a distance of 299½ miles, without changing engines or stopping for a moment on the road was accomplished. The experimental train, consisting of a guard's van, two composite carriages, two sleeping saloons, another composite carriage and guard's van, weighed in all about 112 tons. It left Euston at 8:45 p. m. and reached Carlisle at 2:38 a. m., having performed the journey in seven minutes less than the scheduled time of six hours. The speed averaged nearly 51 miles an hour. The only alteration made to adapt the engine for its long run was to fit larger oil boxes on the larger parts, but it was afterward decided even that was an unnecessary precaution. Mr. Whale and Mr. Earl, assistant locomotive superintendents from Crewe, traveled in the train. There were no passengers in the train except the officials. The previous record long distance run was between London and Crewe—158 miles. The officials expressed the opinion that the journey could have been accomplished in an hour less time if high speed had been attempted."

We dislike very much to strip this "unparalleled feat" of its glory, but the fact is that a continuous run of nearly twice the distance was made on the Pennsylvania Railroad over 19 years ago. To be accurate, it was 438.5 miles, the distance between Jersey City and Pittsburg. The train was the Jarrett and Palmer trans-continental special train, which left New York on June 1, 1876, and made the run of 3,313 miles, to San Francisco, in 84 hours and 17 minutes, with 72 stops, at the rate of 40 miles an hour.

We are indebted to Mr. Theodore N. Ely, Chief of Motive Power of the Pennsylvania Railroad, for our information concerning this performance.

The special train which was to be used for this trip across the continent was taken from Pittsburgh to Jersey City, 438½ miles, without a stop, in about 11 hours. No special mention was made of this run at the time, as it was only incidental to the Jarrett & Palmer trip. The westbound run of the special train, from New York to Pittsburg, a copy of the schedule for which appears below, was also made without a stop, and at no time was the speed of the train less than 30 miles an hour. The schedule was not very fast, it being a part of the through schedule from New York to San Francisco. The same locomotive and cars, which were brought east from Pittsburgh, hauled the Jarrett & Palmer Company westward, but one locomotive being used for the entire round trip of 877 miles, and but one stop being made in this distance.

Miles.		Actual time.	Schedule time.
0	Left New York.....	12:40 a.m.	12:40 a. m.
1.0	" Jersey City.....	12:53 "	12:50 "
56.8	" Trenton.....	2:00 "	2:02 "
88.2	" Mantua.....	2:39 "	2:40 "
154.4	" Lancaster.....	4:26 "	4:26 "
191.2	" Harrisburg	5:18 "	5:20 "
322.8	" Altoona.....	8:12 "	8:15 "
439.5	Arrived, Pittsburg.....	10:58 "	11:00 "

RAILROAD RACING.

In our last issue we gave a brief account of the racing our English friends had been indulging in on the two popular routes between London and Aberdeen. The intention of thus establishing an international record of high speed has been disclaimed by the railway officials, but the public press has had a good deal to say on that score, claiming that the run of the West Coast train of 540 miles in 505 minutes, 64.15 miles per hour, exclusive of stops, could probably never be beaten. Whereupon the New York Central on Sept. 11 ran a special train from New York to East Buffalo, 436.5 miles in 407 minutes and 40 seconds, 64.26 miles per hour, exclusive of stops. The English officials have claimed that the American road took the time while the train was passing East Buffalo at a high rate of speed, while the English road took the time from a dead stop at Aberdeen, and that this difference might account for the slightly faster speed of the American train. Granting this, there is still ample and indisputable grounds for claiming that the performance of the American locomotives excelled that of the English engines on their respective trains. That the English train accomplished its feat at night and the American train "got there" in the day time is little to the purpose, as on a well managed railroad fast time can be made as easily one time as another; but the fact that the English train weighed only about 100 tons, and accommodated only about 35 people (not enough, as the English officers themselves claimed, to pay for running the train), while the American train weighed over 280 tons and had capacity for about 200 passengers, shows that considered from either a commercial or engineering standpoint the American performance is much superior.

These races accomplish but little good except to show the high state of efficiency of the service. They are entirely out of the ordinary, and have but slight practical significance except as just stated. They are too expensive, and interfere too much with the general traffic to be frequently repeated. It is pardonable, perhaps, to say that such runs as these are made without special preparation, notice or previous arrangements, but the fact is that on the English lines the usual precautions taken with royal trains were observed, and the way was cleared a good many minutes in advance of the fast trains, and all other traffic suspended. Doubtless the same is true of our own performance. This does not pay on any road or in any country. But simply as a test of efficiency and as a splendid advertising card such occasional races are all right.

Curiously enough, the supremacy in the English races was determined largely by the kind of cars used on the competing lines, or rather on the trucks beneath the cars. This is explained in the following quotation from London *Engineering:*

"In a letter which appeared a few days ago in the *Times*, the writer maintained that not only was the West Coast stock superior to that of the East Coast, but that the engines were also decidedly superior. Of course, such a statement is quite unwarranted as regards the engines, but we think there is some show of reason when referring to the coaches. The West Coast train consists of eight-wheelers throughout. The only bogie carriages run by the East Coast are the sleeping cars. Over such a road as that from King's Cross to New Castle six-wheel stock will run every bit as smoothly as the bogies; they are, in fact, admirably suited for a straight road with few curves. But when it comes to running over such a line as that from Newcastle to Aberdeen, then we think it is time to adopt the bogie. North of Edinburgh it may safely be said that the road ceases to run straight for more than the length of the Forth Bridge. Even the Tay Bridge has its curve. If proof is wanted, let any one travel from Bristol to Penzance first in a six-wheeler and afterwards in a Great Western bogie."

Doubtless the four-wheeled trucks used beneath the cars of the West Coast route caused less resistance in rounding curves, and thus acted as an addition to the power of the engines.

The New York Railroad Club holds its meetings in the rooms of the American Society of Mechanical Engineers. There is a parlor and hallway leading off from the auditorium. Unfortunately it has become the practice of a number of men who go to these rooms on the occasions of meetings, but who evidently have no interest in and do not attend the proceedings, to congregate in the hallway and parlor and indulge in boisterous conversation, that interferes in a most unpleasant way with those who attend the meetings. On the occasion of the club's recent meeting this annoyance was so great that the president had difficulty in bringing the meeting to order, and finally began his address amid almost a roar of impolite and unsubdued talk. The doors finally had to be closed against the noise, and, it being a hot night, this so interfered with the ventilation of the room and the comfort of the members that it is a wonder their forbearance stood the strain. Such forbearance is misdirected courtesy, and should the offense be repeated it ought to be summarily dealt with.

That the fatality of collision is due to the force of impact, and this in turn generally to the rate of speed, is proved by the numerous fatal accidents that now occur on street railways. The street car used to be considered about the most harmless of movable objects, but when running at speeds made common by modern practice, collision may and often does prove as dangerous and fatal as collisions on steam railroads. This extends to all vehicles that essay high speed, as shown by the numerous recent bicycle accidents due to colliding with other vehicles. This simply shows that, generally speaking, increased danger attends our efforts to more rapidly traverse distances. This is one of the ills that counteract the advantage of improved means of transit. It teaches the necessity of increased caution in management, just as many years ago it taught the same lesson on railroads.

We are pleased to note that the report of the proceedings of the Master Car Builders' convention, just issued, appears inclosed in a substantial cloth cover that gives it the appearance of a book of sufficient value to be placed on the shelf of a bookcase and occasionally consulted. It has the lettering on the back that distinguishes books of this character, as its name, number and date are plainly set forth. Mr. Cloud must bear the responsibility of giving us something that we did not know we wanted so much, and that will make us discontented with valuable reports concealed but not protected by fragile paper

covers. This is something worth emulating by the Master Mechanics' Association.

Governor McKinley of Ohio, in a speech he made recently said: "The way train may have the same running schedule as the through train, but the latter reaches its destination first because it makes fewer stops and keeps going. Exertion is the secret of success in life." If the Governor had ever worked on a "way train" he would probably have a different idea of the amount of "exertion" employed in getting it over the road. Alike with trains and people, advancement, barring accidents, depends on continuous and well-directed efforts, and a minimum amount of squandered time.

The modesty of the Pennsylvania people about some of the notable performances on that line is illustrated by the fact that not until Sept. 22 did Mr. Ely give to the press the information that on Aug. 3 a regular train on the Maryland division covered the 5.1 miles between Landover and Anacosta in three minutes, even, a rate of 102 miles an hour. This is the fastest five-mile run ever made.

Literature.

The Standard Dictionary. Completing Volume II. Full Russia binding. Price $7.50. Funk & Wagnalls Co., New York.

The second and completing volume of this most modern and excellent dictionary has now been issued. Those who prefer can have the work in one volume for $3.00 less than the combined cost of the two volumes.

In commenting on the first volume of this work we named some of its excellencies, among the first of these being its completeness and general quality of being up to date. Thousands of obsolete words are left out of its composition and thousands of new words are included. The newer meanings of old words are given, and the number of words treated are in excess of all other dictionaries. This will be made apparent by comparison. The full number of vocabulary terms in Worcester is 105,000; in the Webster International, 125,000; in the six volumes of the Century, 225,000; in the Standard, by actual count, 301,865, exclusive of the appendices, which contain 47,468 entries.

The publishers claim that in this work for the first time an attempt has been made to reduce the compounding of words to a scientific system. Not that they have attempted to secure absolute consistency with reference to all complex terms in the language. Such an attempt would be sure to fail, but there are may thousands of word-pairs in common use which are amenable to rule in regard to form, and for each of which some one form must be the best. The Standard claims that, in each of these instances, its choice of form is based on principle, and that, in this respect, it differs from its rivals. The general principles are set forth as follows: First, "all words should be separate when used in regular grammatical relation and construction, unless they are jointly applied in some arbitrary way. Secondly, an abnormal association of words generally indicates unifica, tion in sense, and hence, compounding in form. Thirdly, no expression in the language should ever be changed from two or more words into one (either hyphened or solid), without change of sense." It is said that the first principle forbids joining an adjective and a noun in regular use, as spinal column, chestnut horse, brick house, fellow citizen, man servant, Armstrong gun; but arbitrary application requires that such terms be joined as bluecoat, for one who wears a blue coat; redhead, for a duck having a red head, etc.

Messrs. Harper & Brothers have in preparation a uniform edition of Mark Twain's works. The first volume, entitled Life on the Mississippi, will be issued before the end of the year.

Universal Directory of Railway Officials, 1895. Price, $2.50 (10 shillings). The Directory Publishing Company, 8 Catherine street, Strand, London, England.

This is a new publication, the first issue of which has just been sent us by the publishers. It is a directory containing the names and official addresses of upwards of 8,500 directors and chief officials of railways in all parts of the world, also the length, gage, and equipment particulars of the railroads. It is also well indexed for (1) countries, (2) names of railways, (3) names of railway officials, (4) names of manufacturers of railway supplies.

It has 343 pages, 8½ inches by 5½ inches. It is well printed on good paper, and has a smooth, durable cloth cover, with gold and black letters. As far as we know, this is the first attempt that has been made to publish a directory of the railways and the railway officers of the world. It is plain that such a directory, if fairly complete and fairly correct, must contain information of value to persons in many branches of business and in many countries. Being an English publication, it is naturally primarily adapted to the needs of Englishmen, but it seems to us that, barring some slight omissions in reference to American railroads, it is quite as well adapted to the needs of Americans who have dealings, or who wish to have dealings with foreign railroad officers. The value of this book to Americans lies in the information it gives of foreign railroads, and this is certainly sufficient to make it a desirable addition to the office library of every railroad officer and every enterprising manufacturer of railroad material. In fact, it is a good book for every one who has, or may have, to do with the railroads of the world. This directory has hitherto been partly published in sections in the *Railway Engineer*, and even in that disjointed appearance we regarded it as being very useful; but in its present shape its scope is much enlarged and its information presented in a very satisfactory way. If the work is given the encouragement that it deserves it will probably become an annual publication, improved and corrected up to date each year.

Proceeding of the Master Car Builders' Association, 1895. By the Secretary, John W. Cloud, Rookery Building, Chicago.

All persons who are interested in the proceedings of this association will be pleased with the improvements in this year's report. It is rather heavily bound in cloth of the variety known as leatherette. The main thing is that the cover is substantial, and will protect the enclosed pages for many years. The lettering is in gold, in tasteful letters, and the back shows the number and date of the volume, and the initials of the association. Another improvement is the insertion of the information relative to the officers, committees and members of the association, as well as its constitution and by-laws in the front of the book, where it can be found most easily.

Poor's Manual of Railroads for 1895, price $7.50, pages 1,400. H. V. & H. W. Poor, 44 Broad street, New York.

This valuable and admirable publication has now reached its twenty-eighth annual number. It is universally known as the embodiment of the official reports of all the railroad companies in the country. It is the only work of the kind published, and is, therefore, indispensable to every one interested in railroads, either financially or in their operation, or desiring information concerning them. Statements, carefully revised by each company before publication, are given for 1,900 companies. This is the most important department of the work, covering 1,019 of its 1,400 pages.

It contains, as formerly, detailed statements of all steam railroads in the United States, Canada and Mexico, statements showing the financial condition, etc., of the United States, the several States and the chief cities, towns and counties of the country; statements showing the history, financial condition, operations, stocks, bonds and investments, directors, officers, etc., of all leading industrial enterprises; and statements showing for a series of years the mileage, history, operations, financial condition, etc., of the leading street railway companies in the United States.

The list of railway officials given in last year's edition and previous issues, is this year printed separately, but a copy will be forwarded gratis to subscribers.

Crull's Time and Speed Chart. Pages 71, price $1. Rand, McNally & Co., Chicago.

This time-saving chart is in the shape of a book 7½ inches by 4 inches with a flexible cloth cover. It gives the rate of speed when the time and distance are known, the time consumed when the speed and distance are known, and the rate of speed when the distance and time are known. It treats of speeds from two to 69 miles an hour, and of distances from one-tenth of a mile to 150 miles. During these times of races and fast runs and new world's records every one ought to have one of these charts in his pocket.

Fast Run on the Pennsylvania Railroad.

A fast run was made on the New York division of the Pennsylvania Railroad Sept. 18, between Jersey City and Philadelphia. The run was for the purpose of testing one of the new class P engines recently turned out from the Altoona shops. The train consisted of the regular Chicago Limited equipment of seven vestibuled sleeping cars, and weighed 680,167 pounds. The train pulled out of the depot at Jersey City at 1:15 p. m., and ran through to Broad Steet Station, Philadelphia, without a stop in 99 minutes and 15 seconds, reaching there at 2:45:15. The actual distance covered was 90.6 miles, the speed being an average of 54.8 miles an hour. The conditions for fast running were not favorable. There was a strong headwind. All the rules as to slowing up at various points were carefully observed. It was not until after Princeton Junction was passed that anything like high speed was made. Between that point and Trenton several miles were reeled off in 50, 51, and 52 seconds.

Annual Convention of the Master Blacksmiths' Association.

This convention was held in Cleveland, September 3. We published a list of the reports in our last issue that were considered. The convention adjourned to meet in Chicago next year, after electing the following officers: President, S. Uren, Sacramento, Cal.; First Vice-President, R. A. Mould, New York, Lake Erie & Western Railway; Second Vice-President, Henry Jeffries, Pittsburg; Secretary and Treasurer, G. F. Hinkens, Gladstone, Minn.

The receivers of the Northern Pacific filed their annual report in Milwaukee, Wis., Sept. 20. It recommends that provisions be made for extraordinary expenditures in the next five years to the amount of $9,085,000. The gross earnings for the fiscal year ended June 30 were $17,434,980, and the operating expenses $11,319,682, leaving net earnings of $6,115,298, against $4,731,089 in 1894.

To Maintain Rates.

The representatives of 16 railroads have recently been holding daily cessions in New York to try and establish an arrangement to maintain rates on the trunk lines between the Atlantic Coast and the Mississippi River. It is believed that such a plan has been perfected and now awaits the approval of the boards of directors of the roads interested. The agreement must be unanimously accepted by 16 railroad companies in order to become operative.

The main points of this agreement are as follows: The 16 railroads in trunk line and central traffic territory (between the Atlantic seaboard and the Mississippi, north of the Ohio River), propose to establish an executive board of nine members. That board is to have the absolute power to make rates and to enforce them. It is to exercise control over all kinds of traffic, both eastbound and westbound, and it also is to have control of the fast freight lines. Each road will look to this executive board for the protection of its rights, and if any road thinks that it has just cause for complaint such road may appeal to a board of three arbitrators, whose decision shall be accepted as final. Each road that subscribes to this agreement pledges itself to abide by its terms for a period of five years. One of the important provisions of the plan is the establishment of a clearing house for the settlement of traffic accounts between the roads.

The commission of nine, with rate-making powers, by controlling the soliciting agents of the several companies, and making impossible the objectionable methods which have hitherto been resorted to by them in order to secure traffic for their respective freight and passenger lines, will remove a disturbing and demoralizing element, which through unequal rates has injured both the corporations and the public. While under the rules of the new association the rate-making power would be taken from the individual railroads and vested, as far as competitive through traffic is concerned, in the commission of nine, there is the assurance that the object of this commission will not be to advance rates, but to maintain them upon a lasting basis, for the common good, and within the limits of the National law.

A Judgment Against Pullman.

The Superior Court in Baltimore rendered a decision Sept. 26 against the Pullman Company, in a suit for damages brought by a passenger.

Martin Curlander and his wife visited the World's Fair, 1893, and were compelled to occupy upper berths in a Pullman sleeping-car. Riding backward during the day made Mrs. Curlander ill. A sympathizing passenger, who had purchased a section through to Chicago, but left the train at some point east of there, gave his receipt for the section to Mr. Curlander with permission to occupy it. The Pullman conductor resold the section, and forced Mr. and Mrs. Curlander to vacate it.

Mr. Curlander sued the Pullman Company for $10,000 damages, claiming that his wife was made ill by being forced to ride backward. In the trial Judge Ritchie, of the court named, decided that the purchaser of a seat or section in a sleeping car had a legal right to transfer it to whomsoever he pleased, and that Mr. Curlander was entitled to damages because of the conductor's action. The point of law being decided, the case went to the jury after a week's trial. A verdict was returned for one cent damages.

The Largest Drop Hammer.

The Pratt & Whitney Company, of Hartford, Conn., is now constructing the largest drop hammer in the world. It is being made for the Pope Manufacturing Company of the same town. The hammer head weighs 2,000 pounds, and the base 30,000 pounds, the total weight of the machine being 50,000 pounds.

The Southern Railway has ordered eight locomotives of Richmond Locomotive Works. Four will be 6-wheeled connecting engines and the other four 8-wheeled connecting engines.

The Russian Government has had five Church cars, embellished with the accessories of a Greek church, built for use on the Trans-Siberian Railroad. Each church makes two stops a day.

President Fish, of the Illinois Central, has just finished a ten days' inspection of that system. He reports the lines in excellent physical condition, prospects for business good, and the return of better times slow but sure.

So many of the workmen in the Columbus shops of the Pittsburg, Cincinnati, Chicago & St. Louis now come to their work on bicycles that a stable has had to be built to accomodate these silent steeds. About 150 of these are housed and checked every day.

A high wind at Milwaukee Sept. 23 caused a fatal and most unusual accident. While a laboring man was returning home from work in the evening, and walking a half a block away from the C., M. & St. P. tracks he was picked up by the wind and blown down the hill and over the track. Just as he landed on the track a switch engine with five cars came along and passed over him, killing him instantly.

Personal.

Mr. F. J. Stout has been appointed Superintendent of the Wheeling & Lake Erie, with office at Toledo.

Mr. Edward W. Jackson, General Manager of the Interoceanic Railroad of Mexico, died at his home in the City of Mexico, on Sept. 2.

Mr. Robert Blickensderfer has been appointed General Superintendent of the Wheeling & Lake Erie Railroad, to succeed Mr. C. A. Wilson.

Mr. L. L. Foster has been elected Vice-President and General Manager of the Velasco Terminal Railway, with headquarters at Velasco, Tex.

Mr. Geo. A. Ferguson has been appointed Division Master Mechanic of the Boston & Maine at Springfield, Mass., succeeding W. H. Sterns, resigned.

Mr. Joseph C. Wilson, one of the Receivers of the Atchison, Topeka & Santa Fe, died of apoplexy at the Holland House, New York City, on Sept. 18.

Mr. George F. Braddock has been appointed Road Foreman of Engines of the western division of the Wabash, with headquarters at Moberly, Mo.

Mr. Thos. B. Russum has been appointed Assistant Superintendent and Master Mechanic of the New Jersey and New York Railroad, with office at Hillsdale, N. J.

Mr. Richard C. Carroll, General Manager of the Cincinnati Southern, has resigned. The position is to be abolished and the duties of the office are to be performed by Receiver S. M. Felton.

Mr. W. Cockfield has resigned as Master Mechanic of the Mexican Central at Chihuahua, Mex., to accept the position of Master Mechanic of the Interoceanic Railroad at Puebla, Mex.

Mr. A. Kruttschnitt, General Manager of the Atlantic System of the Southern Pacific, is, it is announced, promoted to be Second Vice-President of the company, retaining also his present office.

Mr. George A. Gallagher has been appointed General Foreman, in charge of the motive power and car department of the Lake Superior Terminal & Transfer Railway Company, at Marquette, Mich.

Mr. S. W. Fordyce, President of the St. Louis Southwestern, has been appointed Receiver of the Stuttgart & Arkansas River Railroad Company, which operates about 40 miles of road in Arkansas.

Mr. George L. Bradbury, General Manager of the Lake Erie & Western road, has been appointed General Manager also of the Northern Ohio road, which succeeds the Pittsburgh, Akron & Western.

Mr. O. H. Jackson has been appointed Master Mechanic, of the Santa Fe, Prescott & Phœnix, with headquarters at Prescott, Ariz. He was formerly Master Mechanic on the Indiana, Bloomington & Western.

Mr. C. H. Roser, of Lima, O., has been appointed Superintendent of the Ohio Southern, vice Homer T. Dick, resigned. The position of General Superintendent, held by Mr. J. H. Barrett, has been abolished.

Mr. Thomas Fletcher, President and General Manager of the Industrial Railway, at Chihuahua, Mexico, was instantly killed recently while riding on the cowcatcher when the train went into a washout, the engine falling on him.

Mr. William F. Carleton died of Bright's disease at the Hot Springs Hotel, Yellowstone National Park, on Sept. 17. Mr. Carleton was one of the widely known firm of Carleton & Kissam, of Boston and New York, the largest car advertising concern in the world.

Mr. Bradford Dunham, who some months ago was appointed General Superintendent of the Plant lines, has recently had his authority considerably extended, and in addition to his duties as General Superintendent will hereafter act as Manager of Construction and Chief Engineer of these lines.

Mr. James R. Langdon, Vice-President of the Central Vermont Railroad, and one of the wealthiest citizens of Vermont, was found dead in his room at Montpelier, Vt., Sept. 19. Mr. Langdon was President of the Montpelier National Bank, and had represented the city in the Legislature for two terms. He was born in 1818.

Mr. George H. Daniels, General Passenger Agent of the New York Central, has been elected an honorary member of the International Association of Ticket Agents. The compliment is deservedly bestowed, and indicates a proper appreciation of what Mr. Daniels did for the members in connection with their late trip to Boston.

Colonel H. S. Haines has resigned the office of Vice-President of the Plant System. This action is supposed to mean the confirmation of the report that Colonel Haines will be elected Commissioner of the new Southern Freight Association. He has been President of the American Railway Association and its predecessor, the General Time Convention, since April 1887.

Under the reorganization of the New York & New England Railroad Company, the following officials have been elected: President, Grant B. Schley; Vice-President, Gordon Abbott; Second Vice-President and General Manager, J. T. Odell; Treasurer, Amos T. French; Secretary, Wm. H. Porter, and Chief Engineer, S. B. Bidwell. The new company is to be called the New England Railroad Company.

Mr. Daniel Coxe, of Drifton, Pa., Superintendent of the Drifton, Susquehanna & Schuylkill Railroad, was killed by a miniature locomotive of his own construction Sept. 6. He had a mechanical bent, and had constructed in the rear of his residence a railroad about four miles long, upon which he ran a five horse-power locomotive, which he had also made himself. While running this engine on the day mentioned it left the track, turned over, and Mr. Coxe fell under it. He died a few hours later from internal injuries.

Receivers Thomas F. Oakes, Henry C. Payne and Henry C. Rouse, of the Northern Pacific, resigned Sept. 24. Their resignation is due to the decision of Judge Hanford, of the District Court of Seattle, Wash., on Sept. 1 last, when he concurred fully in the decision of Circuit Judge Gilbert, of Portland, in the case of the Northern Pacific Railroad Company against Messrs. Oakes, Rouse and Payne, in which it was held that Judge Jenkins, in the Circuit Court of the Eastern District of Wisconsin, was not the court of primary jurisdiction, and that he had no authority under the law to name receivers, not having jurisdiction over Northern Pacific property.

The New York Railroad Club.

This club held its first meeting of the season in the evening of Sept. 19. At its opening President West made an interesting address in which he expressed the hope that when the time limit for equiping freight cars with automatic couplers expired that the railroads would not be in such a pitiable plight in reference to the matter as they were recently in regard to the equipment of cars with proper grab-irons.

Mr. F. D. Adams came all the way from Boston to present Mr. Smith, the Treasurer of the club, with a beautifully designed gold badge on behalf of Mr. Smith's many friends among American car builders in token of their regard, and of their appreciation of his services in the interests of the Master Car Builders' Association during the first years of its life, when he served as Secretary nine years without pay. Mr. Smith was taken by surprise, as thirteen years have passed since this service was rendered, but he expressed his gratitude for the recognition implied by the gift, and for the kindly sentiments entertained for him by his friends. It is always a beautiful sight to witness the pleasure with which Mr. Adams, the oldest of American car builders in active service to-day, bestows praises and gifts on his old time associates. This grand old gentleman is always the first to tell of the merits of the older car builders, and is the last to speak of his own, but for which, however, he is much esteemed by railroad men all over the country.

A member suggested as a topic for discussion at the next meeting: "What should be the proper pressure per square inch on driving wheel journals?" Another member suggested that "The large car problem" ought to be given some earnest consideration by car builders. Mr. Adams said that some cars were being built too large to get into New England, as they would not clear platforms, bridges and tunnels.

The Northwest Railway Club.

The Fall meeting of this club was held at the Hotel Ryan, St. Paul, on the evening of Sept. 19. Mr. J. P. Elmer read some "Notes of Travel in Venezuela." The Secretary, Mr. C. A. Seley, read a paper on "Lead for Locomotives," which is published in full on another page.

Some Uses of Air Jets.

A writer in *Cassier's Magazine* states that in turning soft steel shafting, it is customary to use water to which a certain percentage of sal-soda has been added, in order that the water may not rust the finished work, and with a keen tool of the proper temper, and wide enough cutting edge to cover the feed, a very smooth and shining surface can be produced. By using a small air jet, that is, air issuing from an orifice of about one-sixteenth inch in diameter, the work can be finished very much the same as if water is used. A smooth surface will be produced with this important difference, that the tool will not crowd, and consequently, the shaft will be nearer true and straight when using a compressed air jet than when using water. The same sized air jet may be used to advantage at different places around the shop. It is excellent for cleaning off benches and machines, and is much to be preferred to the common dust brush used for this purpose. It is also very convenient at the drill press for blowing out the chips, in drilling and tapping bottom holes.

It is being positively reported that the Philadelphia & Reading Railroad is to be leased by the Central Railroad of New Jersey. The report is just as positively denied.

The Central Railway Club.

This club's first meeting of the season was held at the Hotel Iroquois in Buffalo, Sept. 13, at 2 p. m., President Higgings in the chair. In connection with a communication from Secretary Cloud of the Master Car Builders' Association, it was decided to make the matter of a standard height of drawbars a subject for general discussion at the next meeting of the club in November, and the appointment was authorized of a committee of three to meet with like committees from all the other clubs on Thurday, Nov. 14, at Pittsburg, and organize for a remodeling of the M. C. B. rules of interchange. The result of their deliberations is to be reported to the Arbitration Committee and by it submitted in its annual report to the M. C. B. Association. President Higgins appointed as such committee Messrs. A. M. Waitt, E. D. Bronner, and T. Sutherland.

Mr. E. D. Bronner, presented a report on the management of steam heat in passenger equipment, in which the advisability or necessity of using a trap was discussed. The report suggested that the following questions be discussed and voted on:

1. Maximum pressure to be allowed in blowing out train pipe?
2. Maximum pressure permitted to be carried while trains are running?
3. Can better results be obtained with steam heat if sleepers are carried at front or rear of trains?
4. Should crews have entire charge and reponsibility of heating apparatus on trains or divide it with porters?
5. How should temperature be regulated?
6. A steam trap is clearly not necessary in heating trains by steam. Is it advisable?

After some discussion the subject was continued without action until the next meeting.

Mr. R. S. Miller, from the Committee on "comparative service derived from flues in locomotive boilers working with a steam pressure of 160 to 200 pounds," presented a report, which reached the following conclusion, based on reported experience:

"Your committee believe that with boilers free from mud and sediment, clean especially around the flues, and of sufficient capacity to maintain a certain pressure at all times, regardless of the service of the engine, with exhaust nozzle of proper size and other draft fixtures properly arranged, we would have but little trouble with flues, no matter what pressure of steam was carried."

The report will be discussed at the November meeting of the Club.

An Aerial Electric Railway.

A railway, in which the cars are suspended and the motive power is electricity, has been designed by Herr Langen for Berlin and other places in Germany. The system is adopted for ordinary rapid transit or high-speed service, it being claimed that a very high speed can be attained. Friction plates prevent the derailment of the wheels, and they are secured to the motor plates in the usual manner, the shocks being taken up by springs. The car is fastened to the motor in such a way by a center pin as to permit of lateral play, and is suspended by springs, ensuring easy riding. Each truck has four wheels, and is provided with brakes, which take hold of the rail at top and bottom. Each car has two motors and seats 50 people.—*The Practical Engineer.*

A President's Car.

The Illinois Central R. R. Co. has had an elegant private car built for President Stuyvesant Fish. It is 78 feet long over all and rides on two six-wheel trucks. The exterior is painted the Pullman color, and the interior is elegantly finished in light blue and gold. The interior woodwork is polished mahogany, except the rear end, which is in antique oak. The windows have double shades, white outside and dark inside. The dining-room is 17½ feet long and contains a table for 12 persons. The observation room is 12 feet long and contains a sofa and handsomely upholstered wicker chairs. There are three staterooms having private toilet rooms and dressers; two of these have upright folding beds. The car has a pneumatic letter-copying press.

Early Iron Workers.

The *Iron Age* says that as early as 1282 record is found of the use of swamp ore in Mecklenburg for iron making. In the twelfth century there were 30,000 miners at work in the copper and silver mines of Tyrol. Contrary to the Roman practice, which considered the miner and iron worker as of the lowest class, the miner and furnaceman in Germany enjoyed a high degree of social respect and many valuable privileges. This produced independence and corporate spirit which manifested itself in close, powerful guilds and heroic patriotism. Thus, for instance, when the Tartars invaded Silesia in 1115 the German miners and iron-workers gave battle to the much superior enemy and prevented his further movements in Germany. History says of that battle as to the action of the iron workers: "No one fled, no one was taken prisoner and none remained alive."

Eastern Mexico suffered from the heaviest floods known for many years early in September. The Mexican National Railroad lost 10 bridges by the flood.

The Motive Power Prospect on the Manhattan Railway.

On the recent return of Mr. George J. Gould from Europe, he spoke as follows concerning the reported intention of the Manhattan Elevated Railway Company, of which he is President, to substitute electric for steam motive power on its lines :

No definite decision has yet been made by the Manhattan upon the question of substituting electricity. It is impossible to do so yet, because the practicability of using the electric motor for the Manhattan Railway has not yet been demonstrated. I believe that electricity is the coming power for this purpose. As soon as it shall be demonstrated that it is a success our people will take the subject into definite consideration. Practically speaking, and as a matter of fact, the Manhattan Railway is in a different position from almost all, if not all, other roads. We carry 600,000 people a day. We can run no risks ; we cannot substitute one power for another as a mere experiment, or a possible or even probable success. We must know absolutely that we can make the substitution successfully before we would be justified in undertaking it. It has been clearly demonstrated that electricity is a power that can be used under certain conditions, but it has not been demonstrated that it is a power capable of handling 600,000 people a day without a hitch. If you will recall the trouble and delay which have resulted from slight causes in Manhattan Railway travel, you will see what might happen with a system in which there was any unknown or uncertain factor. In this great city, whose great arteries of travel are north and south, and where congestion may so readily happen from stoppage of trains, we can make no experiments with the public in substituting one power for another.

A Wide Railroad.

Colonel James Andrew, general manager of the Pittsburgh Steel & Iron Company, is said to have devised a novel means for the transportation of freight between Pittsburgh and Lake Erie. His plan is described as follows: There would be four rails laid equi-distant, at the present gage. The cars would be wholly of iron and steel, and have trucks with 8 or 12 wheels, placed under each corner of the car. Thus each car would have from 32 to 48 wheels, carrying from 200 to 250 tons each. The locomotives would each consist of three boilers, with from 24 to 30 driving wheels of small diameter. This would give great hauling power, but slow speed. They would be capable of hauling a train of from 3,000 to 5,000 tons at a speed of from 10 to 12 miles an hour. The inventor figures that the cost would be less than that of a double track road and that the capacity for traffic would be four times greater than at present.—*The Railway Age.*

A New Chinese Railroad.

It is reported that the Chinese Government is preparing to build a new line of railway from Chin-Kiang, an important commercial city in the southern part of the Empire, to Tien-Tsin, in the north, a distance of 700 miles. The road is intended to furnish communication between these cities for military purposes and to develop the country. It will also help to develop the extensive grain and tea region of the south. The only outlet for these products at present is by river to Tien-Tsin.

Acçording to the report, the road is to be built, owned and operated by the Chinese Government. Jeme Tien Yao, a Chinese engineer officer and a graduate of the Scientific School of Yale College in 1881, is to have charge of the survey. It is said that contracts will not be given to Americans or Europeans to build the road, but such engineers as may be needed will be taken directly into the employ of the Government. The new road will not be extended to Peking, the capital of China, which is only 90 miles from Tien-Tsin.

Steam vs. Electric Motive Power.

In speaking recently of electricity as a motive power General Manager Earling, of the Chicago, Milwaukee & St. Paul Ry., said :

"There is no doubt in my mind that electricity will eventually replace steam on all railroads, but the displacement will be slow, and it may be years before it will come around. At present the trolley is an obstacle in the way of the progress of electricity, and up to date I have heard of nothing that takes its place. The underground system in use on the Metropolitan Elevated would not be practicable on anything but a model railroad built in the air. To warrant any road in substituting electricity for steam the traffic must be sufficiently heavy to justify the construction of immense power plants—which it would not pay to build to operate a line running only a few trains a day. At present the St. Paul company is not contemplating the electrical equipment of any of its lines."

An increase in earnings of $319,971 is reported by the Chicago & Northwestern Railway for the month of August.

A great freight blockade was caused on the Northern Pacific Railroad by a fire in the Bozeman (Mont.) tunnel, which started Sept. 12. Five hundred cars were sidetracked in the Helena yards, and on Sept. 22 there were hundreds more standing between Bozeman and Billings. The fire was in the center of the tunnel, which is 3,800 feet long.

Locomotive Boiler Lagging.*

BY R. P. C. SANDERSON.

A few years ago the practice of using wooden boiler lagging was almost universal, but with the advent of higher steam pressures and higher temperatures the wooden lagging has proved itself to be quite inefficient in that after a time it becomes charred and reduced to the consistency of charcoal, when it all settles down under the bottom of the boiler, allowing the jacket iron to rest directly on top of the boiler. When the jacket iron has thus become loose, sparks and cinders are very apt to get in, the flame from the engineer's torch when oiling around is apt to be sucked into the open joints of the jacket, setting fire to the tindery wood and thus causing trouble. As a relief, it was first proposed to make the wood fireproof by treating it with various chemical compositions, but this has only met with very moderate success, for while the wood would not catch fire and burn so readily, it still became charred by the heat and reduced to the consistency of charcoal. It is further very desirable that any lagging used on a locomotive boiler should be such that it is not liable to injury by men standing on it while sanding up the engine, or while working at the pop valves, whistle, etc. It should, therefore, have sufficient firmness and strength to stand the weight of a man's body.

To get over the charring of the wooden lagging, it has been our practice for quite a while to use a thickness of asbestos mill board between the wood rings and the boiler shell. While this was somewhat of an improvement, the results were disappointing, in that the sheet of asbestos mill board is not really a good non-conductor, while it is a very good fire-proof material, and it was found that the charring of the wooden bands and wooden lagging still continued. Fires in the lagging of locomotive boilers were distressingly frequent and occasionally caused delays to passenger trains. To get over this trouble a second layer of thinner asbestos mill board has been applied to the outside of the wood, and all exposed joints or ends of the woodwork flashed with this asbestos under the jacket so as to reduce the danger from fires, but even this, while it has increased the expense of the lagging, has not overcome the difficulty from the charring action due to the heat.

As the oak bands to which the wooden lagging is nailed were the first to give out by becoming charred, we tried using bands made of asbestos, which practice was in vogue on the Pennsylvania Railroad for a time, and may be still in use there. We also tried several plasters and cements on the boilers with a view to doing away with the combustible goods altogether, but these plasters and cements on boilers are objectionable in that external leaks cannot readily be detected. Inspection of the exterior of a boiler, which inspection is very necessary where high pressures are used, is almost an impossibility unless the whole of the plaster is removed, which would be a source of expense. Some of these plasters, too, become disintegrated with long service, settling in the bottom of the jacket in the shape of powder, which, dusted through the joints on to the motion work of the engine, gives it the appearance of having run through a flour mill, which also was not very good for the wearing surfaces of the link motion pins.

I believe that with improved methods of manufacture, it will eventually be found expedient to use some kind of incombustible sectional covering for boilers carrying high pressure steam, which can be fitted to the boiler when it is originally built and which will be so durable that it can be taken down and put up as often as may be necessary during the life of the boiler without injury to itself. In view of the greater care that is now being taken in railroad shops in the matter of inspection of stay-bolts, and the extended use of hollow staybolts, some arrangement of lagging is very desirable which will permit of the examination of the ends of the hollow stays without having to take down any portion of the lagging, or require other expenditure of labor to make this inspection. I am sorry to say that nothing in this line which might be considered satisfactory has yet come to my notice, although I hope some makers will soon produce something that will fill this want.

An Iron Globe.

In the *Popular Science Monthly* for July there is an article on "The Bowels of the Earth," by Mr. Alfred C. Lane, which presents the theory that the composition of the globe we inhabit is largely of iron. In support of this, he claims that there is a kinship in composition of matter throughout the universe, as shown by the spectroscope, and that the stars are composed of the same elements which make up the earth. Corroboration of this is found in meteorites, which are fragments of solid matter thrown off from other bodies in space, but which, in collision with the atmosphere of the earth, dissolve into dust or vapor, or by friction become luminous and explode on reaching the earth. On examination they have been shown to be allied in composition to some of the series of rocks in the earth's crust thrown up by volcanoes. Meteorites are heavier than average surface rocks, and their average weight is assumed to be much nearer that of the whole earth. They are composed mainly of iron. Native iron similar in structure to that of meteorites is found in basaltic dikes in Greenland, apparently torn from the depths of the earth. The rock in which diamonds are found in the Kimberly mine is rich in iron such as is found in meteorites.

"To sum up the argument in a nutshell," says Mr. Lane, "we find among the rocks furnished us by volcanic and igneous agencies from various depths in the earth a series from quartzose and feldspathic rock to those with less quartz and feldspar, more iron, less oxygen and greater weight, in which the presence of a trace of nickel and the occasional occurrence of diamonds and native iron betoken a kinship to the meteorites. The latter in every way continue this series toward a goal which is nearly pure iron, and the weight of the earth as a whole is consistent with this idea that it is largely iron, almost purely so at the center, but gradually, perhaps not perfectly uniformly, growing more quartzose toward the crust."

* Read to the August meeting of the Southern and Southwestern Railroad Club.

They have found out in California that peach stones burn as well as coal and give out more heat. They sell at the rate of $3 a ton.

By direction of the Executive Committee, the date for holding the Annual Convention of the National Association of Manufacturers, at Chicago, has been changed to Nov. 19th.

It is stated that the Pennsylvania Railroad will shortly begin active operations on a number of short branch lines commenced or projected some time since, but temporarily abandoned during the late depression.

The largest diamond in the world was found a short time ago in the mines of Bahia de Pernagus, Brazil. The gem is reported to weigh 3,100 carats, which is 2,129 carats heavier than the largest existing diamond.

The weekly "Sunset Limited" train over the Southern Pacific between New Orleans and San Franciso proved so successful last winter that it is said to be determined to run it twice a week during the coming season.

The Baltimore & Ohio Railroad Company bought the Valley Railway property at the sale of the same in Cleveland, O., Sept. 10, for $3,070,000. This gives a through line from the lakes to the seaboard to the Baltimore & Ohio.

Mr. W. H. Baldwin, Jr., Third Vice-President of the Southern Railway, has issued a circular announcing that employees of the Southern Railway who have been in its service for a period of one year or more will be given leave of absence and passes to Atlanta and return for themselves and families.

The assertion that the corn crops of Missouri, Kansas, Illinois and Texas alone will give 1,800,000 carloads of surplus for shipment is made on good authority, and as the wheat crop of the West is also large, it is evident that the good fortune of the agricultural States this year will be shared by the railroads.

President C. P. Huntington, of the Southern Pacific, is of the opinion that the Nicaragua Canal will never be built, because of the already existing excellent railroad facilities for transcontinental transportation and because the tolls would be exorbitant for the canal passage on account of the large amount of interest to be paid on the cost of construction.

Miss Helen M. Gould has founded two scholarships in New York University in memory of her father, Jay Gould. The scholarships are open only to persons living on the Missouri Pacific system, and each has an endowment of $5,000, expected to yield $250 annually. One of the scholarships is in the college proper, and the other is open only to teachers studying in the School of Pedagogy.

Articles of incorporation have been filed by the Kewaunee, Lake Superior & Southern Railroad Company, which proposes to construct a line from Superior to Prentice, and from Superior to Trenina, Wis., a total length of about 380 miles. The capital stock is $4,200,000. The incorporators are principally Eastern capitalists, Robert Belknap, of New York, former treasurer of the Northern Pacific, being at the head of the enterprise.

The *Canadian Engineer* gives the following recipes for preparation to keep tools from rusting. Dissolve ½ ounce of camphor in 1 pound of melted lard, take off the scum, and mix in as much black lead (graphite) as will give it an iron color. Smear the tools with this mixture, and after 24 hours rub clean with a soft linen cloth. Another coating is made by mixing slowly 6 ounces of lard to 1 ounce of resin and stirring till cool. When semi-fluid it is ready for use.

Australia has a tramp railroad dog that belongs to no one in particular and all engine men in general. He rides on the engines and travels all over the lines in South Australia. He is well known in Victoria, frequently seen in Sydney, and has been up as far as Brisbane. Every engine-driver is his friend. At night he follows home the engine-driver of the day, never leaving him or letting him out of his sight until they are back in the railway station in the morning, when he starts off on another of his ceaseless journeyings.

New rules put in effect on the New York Central require that all the men employed in train service shall be able to read and write. Examinations of these showed to the surprise of the officers that many men heretofore so employed could do neither, and among these were some of the oldest engineers on the road, who had been depending on their firemen or conductors to read their orders to them. It is said that a year is to be given to them in which to learn to read and write. If they are able to do that at the end of the year they will be retained; otherwise they will probably be dismissed.

Communications.

Relatives in the Department.

Editor National Car and Locomotive Builder:

I have noted your article to which you have called my personal attention, which refers to the discharge of men on the Southern Railway who are related to their superior officers. The most interesting part of this discussion is that no such order has ever been issued and no such order was ever intended to be issued.

I note that you consider blood is thicker than water. That is just the point, and wherever I find that there can be any possible relations between a superior officer and any of his employees which will make a tendency to show preference to one employee over another, that condition of things must be changed. I have, for example, transferred to other work a road foreman of engines where he had brothers and nephews or other relatives running under him, and made other transfers in cases where fathers and sons and brothers-in-law were engaged together in road service work, and I shall continue to do so until the whole organization of this road is on such a basis that no individual can say that any employee in any department will have preference either because blood is thicker than water or because of any personal favoritism.

Your own argument answers itself. If blood is thicker than water, it follows that preference will be shown under such conditions, and preference for anything except for ability and seniority is contrary to the fundamental principles of a good organization.

W. H. BALDWIN, JR.

WASHINGTON, D. C., Sept. 25, 1895.

The Accuracy of Valve Gears.

Editor National Car and Locomotive Builder:

It is a common remark of inventors and their friends, in describing the claims of new valve gears, to say that they are mathematically correct, or that they give an excellent, or nearly perfect distribution of steam. Mr. David Joy made such a claim in first describing his radial valve gear (see *Proceedings Inst. Mech. Engineers*, 1880, page 425). He made a similar claim in his recent paper on his new hydrostatic single eccentric gear before one of the engineering societies, as reported in the technical journals some two years ago. Regarding this later gear of his, he particularly mentioned, as a proof of its excellent accuracy, that the beat of the exhaust was beautifully regular—not at all like the irregular beat characterizing the common double eccentric and expansion link gear. Alexander Morton, in his paper of 1882, before the Glasgow Society of Engineers, describing his radial gear (page 8) claims that "*the motion of the slide valve is mathematically alike in amount.*" Arrol and Pringle, in their British patent No. 13,710, of Dec. 11, 1885, for a single eccentric gear, which I have lately been studying, make a similar assertion that their gear is mathematically correct.

Now what do such assertions and claims mean? Any one who has studied valve gears by Zeuner's polar-circle diagram and equations knows well that for all gears controlled by any form of circular motion from the engine driving-shaft the travel of the slide valve from its mid-position is a function of the angle of the revolution of the crank, that is to say, neglecting the "*missing quantity*," and errors due to local disturbances of the gear by its various movements, the slide valve opens, suppresses, exhausts, compresses and opens again at equal angles on the crank path from either dead point, *not at equal points in the piston stroke.* From the Zeuner standpoint, therefore, only a crank-path equality of angles can be termed mathematically correct. Of all the various valve gears invented, Arrol and Pringle's single sliding-eccentric gear alone gives an absolutely true polar-circle diagram, every stage of the valve movements being at equal angles on the crank-path from either dead point, and to use Zeuner's term there is no "*missing quantity.*"

Designers of valve gear, however, never desire this sort of regularity. Their aim always is to produce equality of cut-off in the cylinder, tempered with a slight excess on the instroke sufficient to recoup loss of piston-rod area, or in vertical engines a slight excess on the lower side of the piston to partially balance its weight. Owing to the angularity of the connecting rod the piston always travels farther on the outstroke than on the instroke for the same angle on the crank-path. Hence any valve gear deriving its motion from the driving shaft will give a later cut-off on the outstroke than the instroke, unless it be specially adjusted to avoid this; in other words, to get equal work done on both sides of the piston every endeavor is made to prevent such gears from acting with "*mathematical correctness.*" Designers of locomotive valve gear while aiming at tempered equal cut-offs on the stroke do certainly try to get the exhausts at equal angles on the crank-path, but this is for a wholly different reason, namely, to get a regular beat of the blast, as it is found that an irregular beat does not produce so good a smoke-box vacuum and needlessly tears the fire about. As the crank in a locomotive revolves at a constant speed it is clear that to get a regular beat exhausts at equal crank-angles are necessary.

To get the cut-offs equalized and tempered on the two strokes all sorts of expedients are adopted for "doctoring" the gear, advantage being taken of local disturbances in the gear to set one off against the other, so as to produce the desired result. In link-motion work the moral maxim that two wrongs never make a right does not hold good. With this object the position of the reversing shaft is shifted about, suspension links are made to swing away, eccentric rods are made of unequal lengths and unequal angles of advance given to the eccentrics. Probably the easiest and most fruitful doctoring is got by employing a rocking-shaft to drive the valve. By giving it a suitable location the cut-off can be readily tempered as desired, and with equally good results for both fore and back gear. I am convinced that this useful property of the rocking-shaft explains its universal use on locomotives in America, where with steam chests on top of the cylinders radial gears have made absolutely no way at all.

During the past quarter of a century I suppose I have read every book, published in the English language, treating of link motions and valve gears generally, and nothing has impressed me more than how that nearly all of them ignore the desirability or necessity for this doctoring of the gear and devote pages of useless calculations and diagrams to proving the correct position of the reversing-shaft, length of reversing-arms, drag-links, etc. Zeuner set the example of this pernicious theorizing, but the professors generally have run greedily after him. It is safe, however, to say that not a single gear has ever been executed where engineers have adopted the theoretical proportions and locations for the various parts recommended by these excellent people.

On the other hand, I do not say that engineers are necessarily right in their insistence on the need for equalized cut-offs in the cylinder, and all the dodging and doctoring of the gear which this entails. None, however, of the professors has had the courage to dispute this. Will some of them now consider the matter and inform us exactly what is the gain in efficiency from securing cut-offs in the cylinder equalized on the stroke of the piston rather than on the crank path? In other words, why should the work done on the two strokes of the piston be equal rather than that done through the two halves of the crank path?

To clear the ground I may point out that without the dodging and doctoring referred to, all valve gears wholly operated by eccentrics or return cranks actuated by the driving shaft tend, when laid down in their simplest and most theoretically dictated forms, to give valve movements equalized on the crank path. All single and double eccentric link motion gears come in this class. All radial valve gears where the port opening movement is obtained by a return crank or eccentric (such as Von Hensinger's gear, several forms of Morton's gear and one form of Joy's gear) also tend to give valve movements equalized on the crank path and form one class with the above. Only those radial gears where the port opening movement is obtained from the to-and-from motion of the crosshead tend (so far as local disturbances of this gear may permit) to give valve movements equalized on the stroke of piston. The marine form of Morton's gear and a few other lesser known gears of similar class fulfill this condition. These forms of radial gear where the port opening movement is obtained from the to-and-fro motion of the same point in the connecting rod which by its vibratory motion gives the lead of valve (such as Joy's best known form of gear) lie midway in performance between the two classes above named. The nearer the point taken in connecting rod is to the crosshead, the nearer they approach the second class, and *vice versa.* Will any of your readers now say which of the two classes undoctored is the better?

In conclusion, while on this subject, I may draw attention to the very common, not to say general, assertion (often assumption) made by all sorts of writers that radial gears are superior to link motions in giving a later exhaust with less compression. Joy asserted this of his gear, claiming that he could work in marine engines with a single slide valve only, where before with link gear a separate expansion valve was necessary (see Proc. Inst. Mech. Engrs., 1880, p 428). Such a claim is not according to fact. No greater improvement in that respect is obtainable by employing a radial gear than by employing a link gear, properly proportioned and sufficiently doctored. From experiments with full sized model boards with two different gears operated together, I can assert that for all practical purposes radial gears and link gears designed for the same engine, with same lap and lead, act identically, and the valves operated by both move synchronously.

DIGNA SEQUMAUR.

INSEIN, Lower Burma, India, Aug. 1, 1895.

The Minneapolis & St. Louis road has ordered 200 box cars of the Duluth Mfg. Co.

The Lehigh Coal and Navigation Company has ordered 200 cars of the Bloomsburg Car Company.

The Intercolonial Railway of Canada has ordered 160 flat cars, 75 box cars and 40 hopper cars. Messrs. Rhodes & Currie, of Amherst, N. S., will build 75 platform cars, 40 box cars and 40 hopper cars. The Rathbun Company, of Deseronto, Ont., secured the contract for the other cars of the order.

Pullman's Lost Opportunity.

An officer of the Wagner Palace Car Company, commenting recently on the chronic rumor that the Wagner and Pullman car companies are going to consolidate, said:

"There was a time when such a thing might have been done, and there was also a time when Mr. Pullman could have bought out the Wagner company and become the whole thing, so far as the sleeping-car business of this country is concerned. He could have accomplished it for a good deal less money than now, and at the present time it cannot be done, because the Wagner people have too valuable and profitable a property to part with it. Under the old *regime*, before the present management came in, Mr. Pullman wanted to buy out the Wagner people, and negotiations progressed favorably until he was asked to take over the Wagner cars and pay a certain price for them. That didn't suit his ideas. He wanted it all his own way, and offered a figure that was absurd, and the Wagner people laughed at him. He could be dictatorial and command and settle affairs in his own way with some men, but when he went up against the Vanderbilts he found that he had some one to deal with quite as wealthy as himself, with equal firmness of determination, and a full understanding of the value of their property. The outcome of all this was that a reorganization of the Wagner company took place. Dr. Webb came in as President. He just made things hum. Being backed by men of brains and capital, who practically gave him *carte blanche* for the improvement of the service, he successfully placed it upon the sound basis that it is to-day, extending it to new lines, and with the aid of the competent men with whom he surrounded himself, has made it even more popular, perhaps, than the Pullman service. The establishing of a great car-building plant at East Buffalo that has been steadily increased to meet growing demands, made it possible to turn out equipment that is not surpassed in character, modern improvements, appointments and quality of workmanship, so that to-day the Wagner sleeping and drawing-room car service is without a superior."

Railroad Y. M. C. A. Convention.

The eighth international railroad conference of the Young Men's Christian Association met at Clifton Forge, Va., Sept. 14. Nearly 500 delegates, representing twenty-two States and Canada, were present. W. E. Feen, of New York, read a paper on "The Primary Purpose of the Association Work," and a general discussion on the same topic ensued. Messrs. Mitchell, of Indiana, and Byron, of Wisconsin, read papers on "Lunch and Post Rooms: Their Value and Management." Secretary George B. Hoge, of the International Committee, discussed the advantage and growth of the educational department of the Y. M. C. A., and an address on "The Spiritual Life of the Railroad Man," by the Rev. Theron Rice, of Alexandria, closed the session. President Ingalls, the pioneer in establishing the work and buildings of the Y. M. C. A. along the line of the Chesapeake and Ohio Railroad, addressed the meeting speaking of the great benefit from this work on his line, and the good results in the service obtained by its aid.

A Feat in Telegraphy.

The Glasgow *Citizen* published the following statement Sept. 11 in regard to the manner in which the news about the international yacht race of Sept. 10 was sent to it from New York:

"The messages being long and continuous from start to finish, the average speed of transmission maintained over the Anglo-American cables and *Citizen* special wire is altogether phenomenal and unprecedented. Cablegrams containing words and figures require some little time to manipulate, but bare results were flashed through in seconds; for instance, the message containing the result of the race occupied only one minute in transmission, while the two other short despatches were actually received in the *Citizen* office half a minute after leaving, a feat hitherto unknown in ocean telegraphy."

Big Trees.

The big trees of California are said to be surpassed in height by Eucalyptus trees in Australia, which grow in the Victoria State Forest, on the slopes of the mountains dividing Gipps Land from the rest of the colony of Victoria, and also in the mountain ranges north of Cape Otway. There are only four of the California trees known to be above 300 feet high, the tallest being 325 feet, and only about 60 have been measured that exceed 200 feet in height. But in the large tracts near the sources of the Watts River (a northern ranch of the Yarra-yarra, at the mouth of which Melbourne is built) all the trees average from 250 to 300 feet in height, mostly straight as an arrow and with very few branches. Many fallen trees measure 350 feet in length, and one huge specimen was discovered lately which was found, by actual measurement with a tape, to be 435 feet long from its roots to where the trunk had been broken off by the fall, and at that point it was 3 feet in diameter, so that the entire tree could not have been less than 500 feet in total height. It was 18 feet in diameter at 5 feet from the ground.

The Western Railway Club.

This club held its first meeting of the season at the Auditorium Hotel, Chicago, Sept. 17. The meeting was opened by a brief discussion upon the paper presented by Mr. McElroy at the May meeting entitled "Some Experiments in Car Heating." This was followed by an experience meeting on the subject of grabirons, handholds and draw-bar heights introduced by Mr. P. H. Peck, and participated in by a number of members, several of whom expressed their uncertainty of the requirements of the laws which applied specially to regulating the height of drawbars.

Mr. E. M. Herr introduced a discussion on exhaust pipes and steam passages, and exhibited a drawing of the new exhaust nozzle used upon that road which had given excellent results. Professor Storm Bull read a paper describing a compound locomotive test which he recently made on the Chicago & Northwestern Railway. Two Schenectady engines were tested which were exactly alike except that one was compound and the other simple. The work occupied three weeks, each engine having been tested upon six runs between Milwaukee and Sheboygan. The results showed an average economy of from twelve to fifteen per cent. in favor of the compound locomotive.

The annual banquet was held at the same hotel in the evening, and was attended by 150 guests. Mr. A. M. Waitt acted as toastmaster, and the following toasts were responded to by the parties named: "Our Club," by President G. L. Potter; "The International Railway Congress of 1895," by Col. H. S. Haines, President of the American Railway Association; "Transportation," by Mr. W. F. Merrill, General Manager Chicago, Burlington & Quincy Railroad; "Electricity as a Motive Power for Surface Railways," by Mr. L. B. Stillwell, of the Westinghouse Company; "The Passenger Agent in Railway Service," by Mr. George H. Heafford, of the Chicago, Milwaukee, & St. Paul Ry.; "The Press," by Mr. Harry P. Robinson, of the *Railway Age*.

President Potter said that the membership of the club had grown from 10 in 1884 to 657 at present. He spoke of the improved economies effected in operating brought about by the exertions imposed by the hard times of the past two years, and that these must have been surprising to many mechanical officers who had thought that they were already doing their work very economically. He thought that this economy in operation could be kept up in the future in good times whereby a lasting benefit might be derived.

Mr. Merrill spoke of possibilities of railroads in preven ing widespread distress from disasters and famine, and cited the case of the recent Nebraska drouth in which the hot winds totally destroyed the crops in several sections of the State, and to alleviate the suffering all of the railroads assisted in carrying into that section the necessaries of life, of which the Chicago, Burlington & Quincy Railroad alone carried 41,000,000 pounds, consisting of food supplies, fuel and clothing.

Mr. Robinson called attention to the important relations between railroad men and the press and urged that the officers of railways, upon whom the editor relies for information, should be willing to give out the benefit of their experiences ungrudingly.

Mr. Haines spoke of the impressions he received by attending the International Railway Congress, and insisted that an important lesson was contained in these of great importance to American manufacturers and railroad men. Speaking of the Congress he said:

"Before the recent meeting but little interest had been taken in it by American railroad officials. Mr. Ely, of the Pennsylvania Railroad, and a few others, had attended some of the previous meetings, and when it was decided to meet this year in London they aroused sufficient interest among some other companies to induce them also to become members and to pave the way for the American Railway Association to be represented by its President, Secretary and six other delegates, including Mr. Harahan, of the Illinois Central road, and Mr. Frey, of the Atchison road.

"So on the 12th of June a party of seventeen started from New York. As but few of us had crossed the ocean before we were rather a fresh lot, with much to learn, and, as we found out later, with some things to unlearn. On our arrival at Southampton we got an intimation of what awaited us in the way of hospitality, both from the government and from the railway officials, when we found our baggage passed through the Custom House without examination and a special train ready to take us to London.

"It was with curious eyes that we viewed for the first time their toy-like engines and cars, or, I should say, carriages and wagons, but their massive station buildings, retaining walls, and bridges along the line well deserved the name of permanent way. And so we sped on through green fields and passed thatched cottages and trim hedges and flocks of blacked-nosed sheep that are characteristic of Southern England, and into the very heart of London before we stopped. The next day we rigged ourselves out in high silk hats and long-tailed frock coats that we might be in the prevailling style, for it is a fact that every true Briton arrays himself in this panoply, while in London, and nowhere else.

"I wish that I could dwell upon the impressions made upon my mind during my month's stay in this metropolis of the world. And well may it be so called, for you will see there in the vicinity of the Bank of London other institutions, such as the Bank of Yokohama, of Singapore, of Australia, of the Argentine Republic, etc., representing financial relations with all parts of the world, and I was told that there were then on deposit there over $2,000,000,000, the surplus income of British capitalists awaiting profitable investment. It made my mouth water to think of what could be accomplished with such a fund in our country. But no! for the moment, South Africa, with its gold and diamond mines, attracts their attention, to the exclusion of less brilliant investments.

"The sessions of the the Congress were held in the Imperial Institute, where our little band of 20 to 30 Americans was lost in an assemblage of 700 or more Frenchmen, Belgians, Italians, Austrians and Russians, with a few Germans and an occasional Spaniard, Portuguese, Japanese and Turk. But there was a sufficient number of stalwart, cheery Britons to make us feel at home, and their hospitality was as hearty as it was magnificent. We were provided with credentials which opened to us the doors of every railroad office, signal station and shop, and which also served as passes for ourselves and families throughout Great Britain (including the underground railways in London) and over most of Europe.

"These recreations were intermingled with the work of the congress. Of the value of that work to Americans I can only give my own impressions. The European railway system, in its methods and in the apparatus which it employs, is so dissimilar to ours that a discussion of its details is of but little interest to American railroad men, and that little was rendered less because the most part of the debate was carried on in an unfamiliar language. As a consequence the American delegates were there as lookers on and took but little part in the proceedings; though, when those proceedings are published I know that they will be of value to those who are interested in the details of European railway operations."

Mr. Haines said it was made very plain to him that European railroad men regard our system of light railroads as entirely inadequate to serve the needs of communities requiring new railroad facilities, but unable to meet the expense of such stable railroad building as is common in European countries. Continuing, Mr. Haines said:

"The blessings of civilization are yet to be spread over two-thirds of the globe, and on what system shall the railways be built that are to carry them? The European system is intended to provide improved facilities for existing traffic; the American system to provide facilities for creating the traffic itself; and this is the work that is to be done in South America, Africa, Asia and Australia, while the money to do it with is to be provided from the surplus fund lying idle in London and in the other great money centers of Europe. Wherever this work is done on the European system, American methods, American railroad men, and American railway materials are barred. Is it then of no concern to us to enlighten our European professional brethren as to what the American railway system really is? Of its greater adaptability to the needs of a new country than that with which they are familiar? And how can this be better done than by inviting them to come here and see for themselves the great work that the American system has accomplished?

"The next regular meeting of the International Railway Congress is to be held in Paris during the exposition of 1900, but from our conversation with the delegates at the London meeting, I think it probable that if an invitation were extended to the permanent administration to hold a special meeting here in advance of that meeting, it would be favorably entertained.

"This then is the great lesson to be drawn from the London meeting of the International Railway Congress; that it is of importance to American railroad men and manufacturers of railroad material, as well as to the holders of American railway securities, that the European mind should be enlightened as to American railway practice and its suitability for opening up the vast regions to which European capital is now being attracted and that this should be done by holding a meeting of the International Railway Congress within the next two or three years in advance of the Paris meeting of 1900. For the information which would be gathered by the European delegates at the meeting here would be applied by them in the interim, and the results of their experience would be duly set forth in the official proceedings of the Paris meeting, thus bringing the matter before the European world in a most impressive and convincing way.

"And where could we look for the initiation of such a meeting with greater confidence than to Chicago—the greatest railroad center in the world—the city to which our nation is indebted for the inauguration and the successful conduct of the most wonderful exposition ever seen, which gave to foreign countries their first adequate conceptiou of our resources and of what we had accomplished with them."

Orders have been issued for the completion of the Wilmerding branch, a short stretch of line on the Pittsburg division of the Pennsylvania Railroad.

A newspaper train on the New York Central made the run from Albany to Syracuse, 147.8 miles, on Sept. 25, in two hours and 10.5 minutes, The speed is slightly in excess of 67 miles an hour. This constitutes a new world's record of train speed for this distance.

The number of grade crossings made it necessary to abandon the project for an intramural railway at the Cotton States and International Exposition, but a novel and effective substitute is provided in the shape of a tramway of two-inch plank 18 feet wide, along the main avenues, reaching all the principal buildings. On this roadway there is now operated a line of large herdics, carrying about 18 people each. The circuit of the grounds is made for five cents inside of 30 minutes, including stops at all the buildings. The number of herdics insures a five-minute schedule. These conveyances are similar to those on Pennsylvania Avenue at Washington, and are drawn by fine horses, handsomely caparisoned.

American Railroad Statistics for 1894.

We gather from *Poor's Manual* for 1895, recently issued, that the total number of miles of railroad in the United States at the close of 1894 was 179,279, of which 2,157 miles were constructed during the year.

Compared with 1893, gross earnings decreased in 1894 $142,313,275, to which decrease the elevated railroads contributed $1,315,290, the remainder, $140,997,985, being the decrease upon the surface roads, made up by decreases of $35,946,771 in passenger earnings and $108,017,259 in freight earnings, less an increase of $2,966,045 in mail, express, and other miscellaneous earnings.

In the five years ending with 1894 the railroad mileage increased 21,025 miles. In 1885 the total capital investment was $7,842,533,179; gross earnings equalled $772,568,833, or 9.9 per cent. on capital invested; net earnings, $269,403,933, being 3.4 per cent. on capital invested.

The following table shows the increase in rolling stock from 1885 to the present:

Years.	Railroad.		Locomotive Engines.	Revenue Cars.			
	Total Railroad	Total Track.		Passenger.	Baggage, etc.	Freight.	Total.
	Miles.	Miles.	No.	No.	No.	No.	No.
1885	127,729	160,597	25,937	17,290	6,554	805,519	829,353
1890.....	163,420	208,303	32,241	22.958	7,253	1,061,970	1,092,241
1894.....	178,119	232,919	36,293	27,909	7,937	1,191,884	1,227,730

A Reminiscence.

George Escol Sellers is writing a very interesting series of articles in the *American Machinist* about his early engineering experiences; in one of these articles we find this paragraph:

"It was the result of my experience with the hammer that led me to design my locomotive for overcoming heavy grades by means of auxiliary steam cylinders operating horizontal wheels that gripped a central rail, the force of the grip being regulated by the weight of the train being drawn. I do not now propose to say anything of the labor, care and anxiety that invention caused me. It is too unending a net to get into."

We hope Mr. Sellers will not take it amiss if we supply a few details. He had a small locomotive of about two feet gage, possibly one ton in weight, that ran on a railway in 1848 (?) in a vavant lot in this city. Nineteenth street between Fourth and Lexington avenues. At one end of the railway was a very short steep grade; as recalled it was at an angle of about 30 degrees with the horizon. The engine had a small platform car attached and the load was all the boys in the neighborhood. The present writer happened to be one of them. The engine performed all that was expected of it, apparently, though Mr. Sellers dismisses it with a very brief mention.—*The Engineer*.

H. K. Wick & Company, of Buffalo, have ordered 50 gondola cars of 50,000 pounds capacity of the Erie Car Works.

According to the *Street Railway Journal*, the number of street railways in the United States is 976, the total length of track being 13,588 miles, of which 10,363 miles are worked by electricity, 632 miles by cable, and 1,914 miles by horses, the remaining 679 miles being classed miscellaneous. The number of cars in service on these roads is 44,745, or 3.29 per mile.

The New York *Tribune* is responsible for the statement that John Norton, who is ninety-three years old, has lived all his life in his house near Compounce Lake, Conn., and although he has been in sight of both the Northampton division of the "Consolidated," and of the New England Railroad, he never rode in a car of any kind until recently. The old man is hale and hearty, with all of his faculties keen and alert, and has a good prospect of living to be 100. He seemed to enjoy his ride very much.

E. Furke, the head chemist of a sugar refinery at Chino, Cal., has invented a queer pavement. It is made mostly of molasses, the kind used having been a refuse product hitherto believed to be utterly worthless. It is simply mixed with a certain kind of sand to about the consistency of asphalt, and laid like an asphalt pavement. The composition dries quickly, and becomes permanently hard. The heat of the sun, instead of softening it, makes the pavement harder and drier. A block of the composition successfully withstood repeated blows of a hammer, and showed no signs of cracking or bending.

In a recent communication to the *Societe Industrielle de Mulhouse*, M. Mathieu Mieg gives some particulars concerning a deep borehole sunk at Oberkutzenhausen in 1893. The total depth reached is 1,670 feet. For 54 feet from the surface the hole is lined with tubes 14¼ inches in diameter, but from that level down to one of 1,620 feet the lining is 4¾ inches in diameter. Notes taken of the increase of temperature with the depth shows this to be much greater than usual. Thus, at a depth of 770 feet the temperature was found to be 64.4 degrees Fahr., while at a depth of 1,670 feet it was 105.8 degrees Fahr. the rate of increase having been pretty uniform throughout. From these figures it will be seen that the temperature has risen at the rate of about 1 degree Fahr. for every 22 feet traversed.—*Engineering*.

Coach Painting.*

So much has already been written and said upon the subject of coach painting, that it would appear no more remains to be told. But while the methods of painting as pursued in most shops are about the same in general they vary somewhat in detail, therefore it would doubtless prove interesting reading to give in detail the method as pursued by various shops. Doubtless in many shops, as in my own, expediency has a great deal to do with dictating and regulating the method to be practiced, in order that the pattern shall be cut according to the cloth.

The method of repainting and revarnishing passenger equipment, as practised in this shop, is about as follows: When a car is shopped for revarnishing, the carpenters first remove all component parts such as sash and blinds, seat backs, lamps, etc., including the screens from the deck. Next the scrubbers are set to work and thoroughly dust out all collections of dust and cinders, the floor is given a coat of slush to prevent the water soaking through and wetting the sills and framing. When this is dry, the scrubbing is proceeded with, and the car is thoroughly cleaned in and out. Next, all scarred and bruised places on the exterior are puttied and touched up, and the car given a coat of finishing varnish. In the meantime the furniture is passing through the hands of the scrubbers. Now the interior next receives attention, and if the varnish is in a condition to require it, it is thoroughly dusted and given a coat of outside rubbing varnish, which completes that portion of the job, as no rubbing or polishing is done, the same having been abolished some years ago. Now the furniture is next taken in hand and touched up and given a coat of varnish. Next the roof, deck, trucks and platforms are proceeded with. The deck screens and stationary portion of the deck are given a coat of varnish color. The tinners having finished patching the roof, all such places and rusty spots are touched up with a coat of mineral paint. The trucks and platforms are given one coat of truck color, and the iron a coat of varnish black. By this time the exterior of the body, having sufficiently dried, is given another coat of finishing varnish; also the exterior of the sash and blinds, but the blinds receive only one coat on the inside. Next, the lamps, chair castings and all the minor details are taken up. The chair castings are bronzed and lacquered, and the lamps given a coat of lacquer. The window sills receive one or two extra coats of varnish, also the saloons around the urinals, and around the water cooler, those portions being always the first to perish. Now the deck screens are replaced, and the entire deck given a coat of finishing varnish; the following day the roof is painted and the bull nose sanded in order to counteract the attrition of the cinders. The car floor is next painted and the trucks and platforms varnished, and the job is turned over to the carpenters as soon as dry to replace the furniture.

In the matter of repainting, we will suppose a tongue and grooved siding, or sheathed car that is to be burned off, in which case a force of men are set to work with gasoline burners to remove all the old paint, except perhaps the upper portion of the ends. The car is next scraped and sandpapered, and given a coat of lead color, mixed with as large a proportion of raw oil as the surface will absorb. The following day the job is puttied, and after waiting sufficient time for drying is sandpapered and given a coat of flat lead color. The following day the facias posts and belt rail are given a knifing coat, which coat is mixed of lead, and made as elastic as possible. When dry the job is again sandpapered and given a coat of flat lead color, except the knifed portion, the color for which portion is mixed with sufficient oil to counteract al absorption. This coat is next sandpapered, when the car is ready for the body color. For this stage of the work, especially all hurried work, the two coats of flat body color, and three coats of finishing varnish as formerly used, have been abolished, instead of which the car receives two coats of varnish color (the color being ground in varnish instead of japan). This is next rubbed with curled hair to remove the gloss, and the car is next "laid off," that is the stripes, letters, etc. As no gold is used the stripes and letters are put on with imitation gold color and are given two coats in order to make a solid job. The following day, if it is a rush job, the car is given a heavy coat of finishing varnish which completes the exterior. But when time admits, two coats of finishing varnish are given. It will be observed from the foregoing that the use of flat color is avoided, and that the varnish color not only takes its place, but at the same time almost fills the office of two coats of varnish, and when the job is completed is really more elastic throughout. It will also be observed that rough stuff and pumice stone are not mentioned, they having long since been relegated to the past as being slow and costly.

But to return to the subject, the interior and furniture of the car receive about the same treatment as in the case of the car that was revarnished, except that the sashes are re painted and grained. The roof and trucks also receive the same treatment.

In the case of painting a new coach, the treatment of the exterior is about the same as before stated, but that of the interior varies, of course, according to the requirements of the case. In this case the wood is given a coat of filler, is thoroughly scraped in and wiped off with Excelsior. After drying sufficiently it is next sandpapered and given a light coat of shellac, which is also sandpapered closely in order to leave none remaining except that which enters the pores. A coat of rubbing is next applied, and when dry is lightly sandpapered and a second coat applied. This coat, after having thoroughly hardened, is closely sandpapered and the third coat of inside finishing is applied, which completes the job, as no rubbing or polishing is done.

Another feature of coach painting is "cutting in," in which case the car is first stripped of all furniture, and scrubbed inside and out. All bruised or broken places on the outside are touched up and puttied. Then with pencils and soft brushes the painters proceed to cut in around all stripes or ornaments. The color for this coat is mixed with sufficient finishing varnish to prevent cracking and flaking. The following day the car is given a coat of finishing varnish and when this is dry a second coat is applied and that part of the job is complete. The furniture receives the same treatment as in the caseof revarnishing, which treatment is, however, varied to suit the exigencies of the case.

Cutting in is never resorted to except in such cases where the color has become so faded as to be beyond restoration by aid of revarnishing, and in such cases where the varnish has perished from age, and the dirt cannot be removed by washing.

The exterior of baggage, mail and express cars receive the same treatment as the coaches. But the interior of express cars (in case of repainting) are lightly scrubbed and finished with one coat of varnish color, while the baggage cars are painted white overhead and the walls are painted, grained and varnished.

* J. H. Pitard in the *Painters' Magazine*.

Asphalt Roofing.

The Warren Chemical Company, whose works are at Long Island City, N. Y., and offices at 81 and 83 Fulton street, New York, has issued a handsomely illustrated album, showing artistic views of the many notable buildings in different cities covered with the "Anchor Brand" of natural asphalt roofing made by this company. These include the new shops of the New York Ceutral at Depew, N. Y.; freight houses of the West Shore Railroad at Weehawken, N. J., and man other railroad structures, besides many public buildings, large factories and elegant private dwellings.

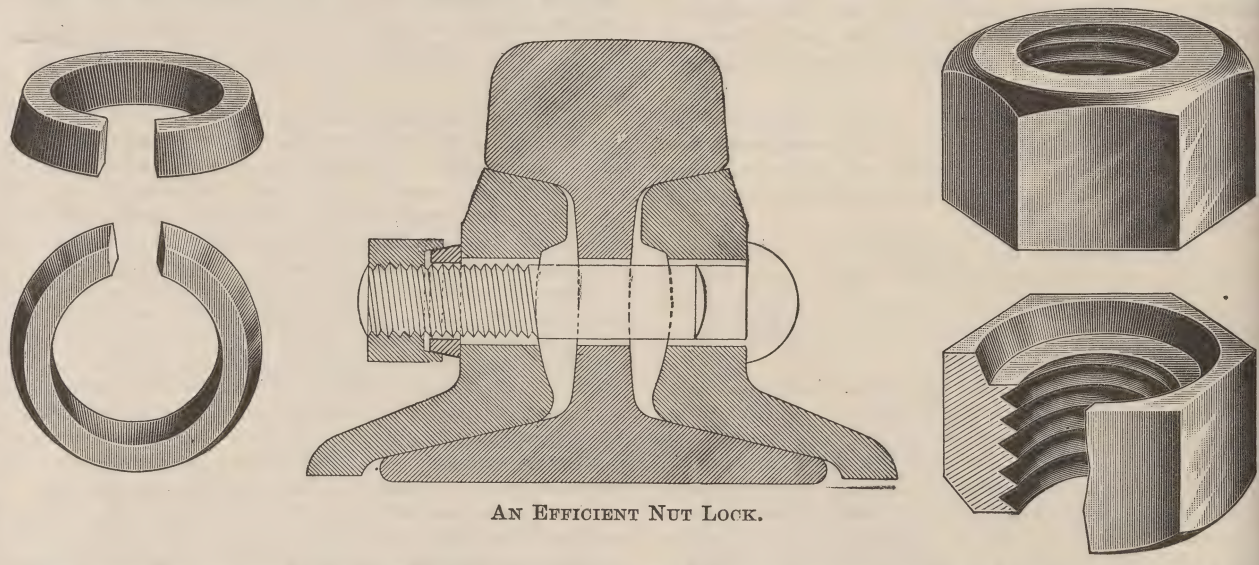
The characteristics of natural asphalt make it peculiarly adapted to roofing purposes, and these are described in Ure's Dictionary of Arts and Sciences as follows:

"There is certainly no class of mineral substances so well fitted as the bituminous, by their plasticity, fusibility, tenacity, adhesiveness to surfaces, impenetrability by water, and unchangeableness in the atmosphere, to enter into the composition of terraces, foot-pavements, roofs and every kind of hydraulic work. Bitumen, combined with calcareous earth, forms a compact semi-elastic solid, which is not liable to suffer injury by the greatest alternations of frost and thaw, which often disintegrate in a few years the hardest stone; nor can it be ground to dust or worn away by the attrition of the feet of men and animals, as sandstone flags and even blocks of granite are."

The Warren Chemical Company makes a specialty of the manufacture of asphalt roofing materials. These are in a variety of forms, among the most useful being a variety of felts well adapted for car roofing. The "composite" is composed of one sheet of best manilla-rope paper, and one sheet of saturated roofing-felt, well cemented together, as in two-ply felt. It is said to be many times stronger than the best brands of tarred felt, and combines the advantages of a two-ply felt with lightness and strength.

The Kleman Nut Lock.

The nut lock shown in the following cuts is made by the Allison Manufacturing Company, of Philadelphia, and is known as the Kleman nut lock. Tests covering a period of five years have been made on railroad cars and tracks, drop presses, steam hammers and other machinery subject to vibration, and have proven the excellency of this lock nut. It consists of a combination nut having a countersunk cavity on its inner face, and an annular tapering divided washer fitted in the countersunk recess, the washer being made of a sufficient depth that when the nut is tightened on the bolt the washer will project from the recess and bear against the plate or bearing. The washer is oil-tempered and made of the best spring steel. In applying the nut lock to use the washer is put on the bolt against the bearing, and then the nut is screwed home upon the plate until its countersunk cavity encircles the washer. Further tightening the nut will compress the washer which is around the bolt and will press against the bearing applied and cause the nut to lock on the washer, as will be readily understood by reference to the cuts. The nut itself does not bear against the bearings or plate applied, as the outer face of the washer does not extend to the base of the cavity. In the nut space is allowed for expansion and contraction of the bolt. The bearing against the plate is taken entirely by the washer, and as this is divided it will yield so as to fit easily against the plate, and afford a perfect bearing, even though the plate be irregular in shape, whereas if the nut should be allowed to bear against the plate such evenness of bearing is not always attainable.



AN EFFICIENT NUT LOCK.

Some laboratory tests of bolts equipped with these nut locks were made. In the first test the bolt broke through at 7,900 pounds; in the second test the bolt broke at 12,200 pounds. In the second series of tests, using three-quarter inch iron, the bolt broke at 18,200 pounds, the bolt being very much drawn out and reduced at the point of fracture. In the third series of tests in which was used untempered steel, the bolt broke at first test 16,600 pounds, and in the second test 38,400 pounds. These tests were made to prove the efficiency of the nut and washer. In all cases the nut was left in perfect condition.

Some Ancient Experiments in Coinage.

Some curious lore has been exhumed from the classic writers by Professor Ridgeway, of Queen's College, Cork, and lately published, which indicates that the bimetallic problem is not peculiar to modern times. He is quite convinced by his studies that the various Greek communities, long prior to the Christian era, were engaged in a prolonged quest for that ratio of gold to silver for mint purposes which many of our village financiers and crossroads thinkers imagine to have been fixed by nature, or else is so immaterial that a joint resolution of Congress would be sufficient to settle it.

As the result of deep and curious studies of ancient literature Professor Ridgeway concludes that for centuries the monetary unit, from Babylon to Greece, was a gold coin weighing usually from 130 to 135 grains. He believes gold was known earlier than silver, for it occurs native, while silver can only be obtained by metallurgical processes. The ox or cow was from one end of the ancient world to the other the chief primitive measure of value, and he concludes that this gold coin, known in different countries by different names, was the equivalent in value of the ox or cow.

In a prolonged period during which the gold coin underwent no change in any part of Greece, the silver coins vary as between one district and another and one period and another in the same city or State. The professor believes the evidence is conclusive that the Greek States suffered as modern States have from the fluctuations in the relative values of gold and silver coins. Xenophon remarked that the discovery of gold cheapened that metal and made silver dearer, and Strabo quotes a statement that gold fell a third in Italy after the discovery of a certain rich gold mine.

In Macedonia the weight of silver coins was several times changed. It was 220 grains about the time of the Persian invasion, when the Bisaltian mines made silver abundant; later it was 170 grains. Professor Ridgeway conjectures that the silver coin was struck at a weight to make ten pieces equal one gold stater, the weight of which did not change. The exhaustion of the Bisaltian mines or a greater production of gold would have increased the relative value of silver and occasioned the reduction of the weight of the silver piece from 220 to 170 grains. Philip reverted to the silver piece of 220 grains, and Alexander coined a silver piece weighing the same as the standard gold piece and suggesting that silver had risen in value to the ratio of 10 to 1.

In Phœnicia there was a gold shekel of 130 grains and a silver piece of 220 grains, and if ten silver pieces were worth one gold piece, this would argue a ratio of 17 to 1, which is not improbable after the Phœnecian ships had carried home great quantities of silver from Spain. One captain is said to have thrown aside his anchor and substituted one of silver in order to carry more of the metal home. But there was an Ægimetan standard implying a ratio of 15 to 1, for the gold coin weighed 130 grains and the silver coin weighed 195 grains. In these and other instances, the comparative constancy of the weight of the gold coin, whether called a daric, or a shekel, or a stater or a didrachm, and the wide range in the variation of the weights of silver coins is very suggestive.—*The Iron Age.*

Cardboard checks for baggage have been substituted for brass checks on the Atlantic system of the Southern Pacific, and are said to give much better satisfaction and result in fewer losses.

Over a hundred set of Leach's pneumatic track-sanding apparatus were ordered of the maker, Mr. Henry L. Leach, Mason Building, Boston, during August. Eight of these were for the Southern Railway, 10 for the Burlington, Cedar Rapids & Northern, and 30 for the Lake Shore & Michigan Southern.

Messrs. Pratt & Lambert, manufacturers of varnishes and japans, of 47 John street, New York, are now making a specialty of their "Perfect" wood filler. This filler will not crack, scale or peal off wood or iron, and is not affected by heat or cold. It will fill and hold up on sappy wood, and can be mixed with any dry or japan color and applied as a first coating, giving a combined filler and color coat. The use of this filler greatly facilitates the work of painting and saves time. It is claimed to fill at least one-third more surface than any other filler, and is made of sufficiently heavy body to bear reduction with turpentine from one half to two-thirds, according to the grain of the wood. This reduces its cost to the consumer.

The Passing of the Locomotive.

There is something almost pathetic in the spectacle of the steam locomotive engaged in a hopeless fight with the all-conquering trolley. We can all remember Mr. Ruskin's diatribe against railways, and there are some of us who can go back to a day when it was a distinction to have been a European traveler. A man who had made the grand tour was familiarly known as a Hadji, and presumably entitled to the privilege of wearing a green turban, if it so pleased him. And then came steam, which changed all that; and now it is electricity, and piston rods and cylinders are doomed to swell the dust heap along with the post-horns and leather curtains of the stage coach.

The trolley is cheaper and more effective, and that tells the story. Where we used to build branch railroads we now put up a trolley line, saving both in initial cost and in subsequent operating expenses. Road wagons and private carriages to run independently over a system of trolley lines extending in a vast net work throughout creation are a possible feature of the near future, and in the mean time experiments are being made on the great trunk lines looking towards an entire change in motive power. One of the New England railways has already introduced the trolley on branch lines; the big electric motor built for the Baltimore and Ohio Company has more than fulfilled expectations; an electric supply company has taken the contract to turn the elevated railroad of New York City into trolley lines; and, according to newspaper reports, a syndicate is to construct an electric road between Chicago and New York, upon which the journey of a thousand miles is to be regularly made inside of six hours. The change is inevitable, and in logical accordance with the spirit of the age.

And yet one may be permitted to think with a fleeting regret of the old order that is changing so rapidly before our very eyes. There was a certain element of picturesqueness, Mr. Ruskin to the contrary, in locomotion by steam. The engine itself, an uncouth Frankenstein, with stentorous lungs and heart of fire, was yet irresistibly attractive in its very ugliness, and commanded respect as the visible embodiment of a mighty power. And then the fast trains, with their fascinating popular nomenclature, "The Flying Dutchman," "The Wild Irishman," and our own "Limited" and "Exposition Flyer." It was a distinction in itself to have been a passenger on the "Scotsman" or the "Cannon-Ball," just as in the old days it was a matter of pride to have had one's name inscribed on the booking-sheet of the "Royal George" or the "West of England Mail." How prosaically it will read on the time-tables of the future: "Cars for Chicago and San Francisco will be run on 10 minutes' headway; to Jerusalem, Kamtchatka, and Far Cathay every half-hour."

There is a romance of the railroad, as there was of the stage-coach, and some day it will be written—a story of wild engines and of misplaced switches, of phantom signals and of loaded safety-valves. But it will not seem to have been romance until it has become history.

Some day, again, Mr. Maxim will discover the secret of his æroplanes and teach us all to fly. Then in its turn will the vulgar yellow-bodied car, with its unsightly posts and hideous gong, depart and be no more seen, and perhaps some one, in sentimental mood, will write a paragraph or two on the "Passing of the Trolley."—*Harper's Magazine.*

Fireproof Baker Car Heaters.

Mr. William C. Baker, of 143 Liberty street, N. Y., the manufacturer of the well-known and widely used car heaters that bear his name, has issued a very nicely printed and illustrated pamphlet full of information about car heaters, and showing the various types of those designed and made by him.

Acting on the belief that the source of heat must be a part of the car itself—as much so as the seats, and other portions of the car; and also on the fact that every thing must yield to the colliding force of a locomotive, these heaters are constructed both fireproof and break-proof. The fire is inclosed and completely enveloped within a ¼-inch flexible steel case, that will bend and yield to any shock, but which cannot, under any condition, be ruptured, pulled apart, or in any way allow the fire to escape.

The single, dull fire, characteristic of the Baker heater is secured within four cylindrical casings, the outer one being a single sheet of soft, flexible, wrought steel, and the inner one a jointless, continuous, close wound coil of water—the generator coil of the heater.

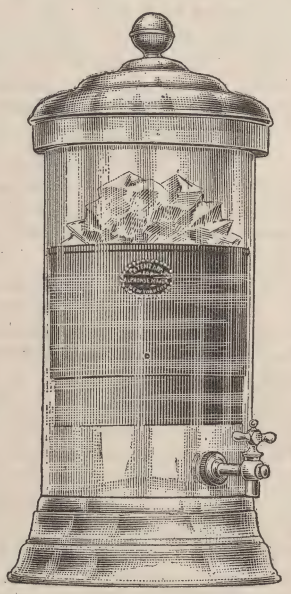
A Unanimous Vote.

Two men who had been sitting together in the seat near the door in a railway car in the West, according to *Pearson's Weekly*, became engaged in an animated controversy, and their loud voices attracted the attention of all the other passengers. Suddenly one of them rose and said: "Ladies and gentlemen, I shall appeal to you to decide a disputed point. My friend here insists that not more than three persons out of five believe they have souls. I take a more cheerful view of humanity than that. Will all of you who believe you have souls raise your right hands?" Every hand in the car went up. "Thank you," he said, with a smile. "Keep them up just a moment. "Now, will all of you who believe in a hereafter please raise your left hands also?" Every hand in the car went up. "Thank you again." he said. "Now, while all of you have your hands raised," he continued, drawing a pair of revolvers and leveling them, "my friend here will go down the aisle and relieve you of whatever valuables you may happen to have. Lively now, Jim."

"Keep your seats, ladies," said the polite train robber, but after he left they found that that was about all they had kept.

Major's Water Coolers.

The accompanying cut shows an improved form of the glass ice coolers made by Mr. A. Major, of 461 Pearl street, New York. It also shows the "float" which holds the ice separate from the water. These coolers are intended for use wherever the old style has been used. It is adapted for use in the home, the office, the workshop and the railroad car. The body is of glass, and the top, bottom and faucet are nickel-plated. The appearance of the cooler is therefore very bright and ornamental, and when supplied with ice makes a pretty, gleaming sight. This is the least of its desirable



Major's Water Cooler.

qualities, however, as by holding the ice separate from the water the consumption of ice is reduced, and such impurities as may be contained in the ice are withheld from the water. Perhaps its chief merit lies in the fact that the water, instead of being made icy cold, is given a refreshing coolness similar to that of spring water, which enables one to take a good, satisfactory drink. Floats made to fit any cooler are sold separately if desired.

The Martin Anti-Fire Car Heater Company, of Dunkirk, N. Y., informs us that it has received an order to equip the cars of the Duluth, Missabe & Northern Railway with its straight system of steam heat.

Mr. L. B. Sherman, for many years connected with the *Railway Review*, of Chicago, has been appointed Western manager for "The Official Railroad Equipment Guide and The Pocket List of Railroad Officials." Mr. Sherman assumed his new duties Sept. 1, with headquarters in Room 425 Rookery Building, Chicago.

Mr. H. M. Norris, whose name is more or less familiar to our readers, has accepted the important position of Superintendent and Mechanical Engineer of the Riehle Bros. Testing Machine Company of Philadelphia. This is the oldest established and best equipped testing machine company in the country. Mr. C. E. Buzby, who for a number of years has been its efficient superintendent, is about to retire from active business, but will remain with the company in the capacity of consulting engineer.

The E. D. Bangs oil cups have been specified for the new steamship *St. Paul*. The steamships *St. Louis, New York* and *Paris* are also equipped with these cups, the *St. Louis* having 118 of them in use. These cups are made by the E. D. Bangs Oil Cup Company, of Milwaukee, Wis. This cup is coming into wide use and is giving exceedingly good satisfaction. It distributes the oil evenly, a small particle at each stroke of the crank, eccentric and cross-head; it is positive in its feed and cannot be stopped up by sediment. No filtering of the oil is necessary. No oil is wasted while the engine is idle, as it feeds from the top, being thrown up by the reciprocal motion of the engine and directed to the feed hole by a spoon-shaped oil guide.

Prior to the departure of an excursion train for Edinburgh on the morning of our recent annual holiday, two noted Arbroathians were standing in front of the booking office window watching and admiring the clerk's expertness in selling tickets, when the following dialogue was overheard between them: Geordie—That chap kens his wark, Sandy; but fat's his reason for pushin' the tickets intae that clickin' machine? Sandy—I'm astonished at yer ignorance, Geordie; dinna ye see that he prents the name o' every passenger on the tickets as he sells them? Geordie—But he's no speirin' their names, an' hoo does he ken them? Sandy—He disna need, he's a gleg chiel that, min, an kens a' the fouk in Arbroath, auld an' young, three an' twenty thoosand o' them. —*Dundee News.*

The Phosphor-Bronze Smelting Company, of 220 Washington avenue, Philadelphia, announces that it has purchased the processes and exclusive rights for the manufacture of "Delta metal" in the United States, and is now prepared to furnish the same in castings, stampings, forgings, bolts, rods, etc., of equal quality to those made in Europe. "Delta metal" has established an enviable reputation throughout England and the Continent for exceptionally high properties; it possesses strength equal to mild steel, with great rigidity, toughness and resistance to corrosion, and is especially adapted for use in making drop forgings and stampings, valve stems, screws, bolts and nuts, and all purposes requiring exceptional strength at moderate cost. This metal is not a substitute for the well-known "Elephant Brand" phosphor-bronze, but occupies a field distinctively its own.

The Man With a Hot Dollar.

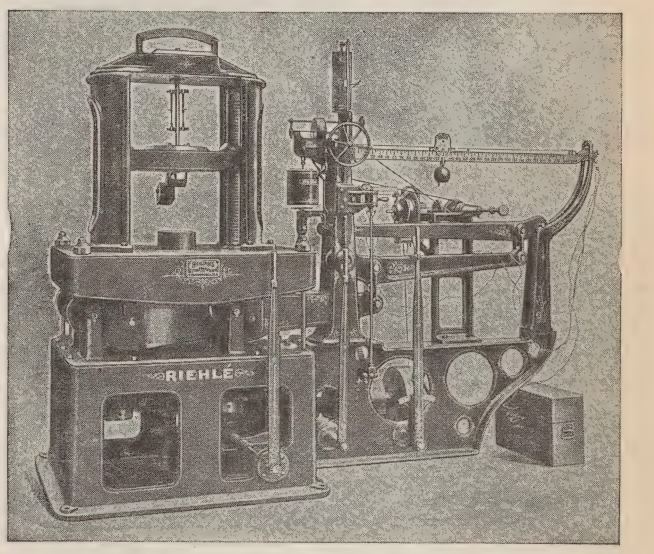
A man with a hot dollar is known by his anxiety to get it into an ice box. In such cases a warm pocket is the soonest emptied. It makes no difference whether the pocket contains a whole silver convention, or has but a solitary coin in lonely seclusion, one and all are bound to tumble over each other to cool off elsewhere. It is also to be noted that on leaving Africa they seldom return, and a hot dollar once on a wheel goes out of sight forever. Now if it went forth like a bee in the morning light, in quest of a clover patch, and came back loaded with pollen, and a patent right to make honey, there would be no juvenile bees in the hive missing their three meals a day. It is a case, however, of wastefulness and folly, where repentance fails to recall what is lost, or to regain what has been thrown away. Penitence and a wet handkerchief cannot warm a cold toe or replace a missing overcoat. Regrets cannot pay house rent, or get even a cold potato on credit. A dime is worth more than a tear at a grocery, and a long face can never pay a debt.

When dollars were bright as a butter cup and plentiful as blackberries, the wheels of life were well greased and everything went smooth as a skating rink. The grocer's face was radiant, the tailor's hand was warm, and everybody was a rainbow. Friends sprung up like mushrooms and the hinges of the gate never got rusty. Favors could be had for the asking, from a kitten or a canary to a horse and buggy for a Sunday ride, or a loan secured without a note. The last of the hot dollars saw the last of these, and the heart of the world, warm as a new laid egg and large as a Georgia melon, became as frigid as a tax-collector and as diminutive as an early gooseberry.

It is thus that too many who waste their dollars find out when too late that an empty pocket has but few friends. All this and much more has been re-enacted over and over again, and yet the man with a hot dollar is as numerous as ever, and as able-bodied and square-shouldered a fool as was the first of the family. He is to be found in every workshop and in all grades of society. Molders and millionaires, bankers and bricklayers, hod-carriers and the heirs of deceased uncles, are all to be found in the great cobweb, where the spider of waste makes a free lunch of foolish flies. We may find more workingmen in a day than would pack a convention, who are looking on shoes that once had soles but now have not, on houses that were once their own but are on the rent list of somebody else, and on little graves where eyes are blind and hands are cold, that would be looking out of the windows to-day, stroking a gray head to-night, had it not been for the man with the hot dollar. And of those who were born into a world of velvet and money we may find a great drift of human wrecks who, had they been obliged to dig wells or make shoes, would have never degenerated as they have. As it is in labor, there are many men to whom an advance in wages is but a broader stage on which to play the fool, and $20 a week would go as fast as $10. You need not take a lantern to find the man.—*Fred Woodrow, in the Age of Steel.*

Riehle Automatic and Autographic Testing Machines.

This is a very complete machine of moderate capacity, combining automatic weighing apparatus with variable speeds with the latest improved autographic recording device. This machine was first made for hand power, and in using the automatic attachments, belt power was introduced for the purpose of communicating regular and steady movements to the working parts. A round belt from the counter-



Riehle Automatic Testing Machine.

shaft drives the disk of the weighing apparatus, while a second flat belt is used to transmit the power.

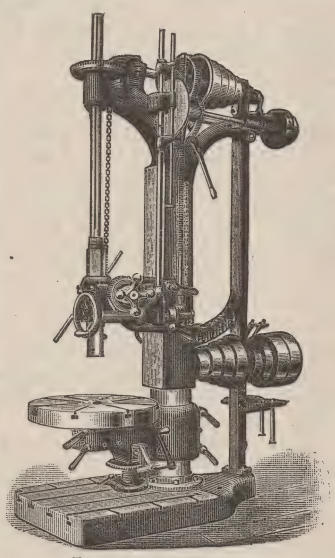
The motion of the poise is transmitted to the diagram by the screw and nut carrying a pencil in a vertical direction, while the stretch of the specimen is communicated by a multiplying extenso-meter to the vertical drum, causing it to revolve, thus forming a complete strain diagram.

This automatic machine is made in capacities from 20,000 pounds up to 400,000 pounds, by the Riehle Brothers Testing Machine Company, of Philadelphia.

The convention of the Master Car and Locomotive Painters' Association, which was held in Cincinnati early in September was given an excursion to Dayton and return Sept. 12, by the "Big Four" road. They visited the plant of the Barney & Smith Car Company, and also the extensive plant of the Lowe Brothers Company, the widely and deservedly well-known manufacturers of high standard railway paint. In the evening the delegates were given an elegant banquet by the Lowe Brothers Company at the Home Hotel.

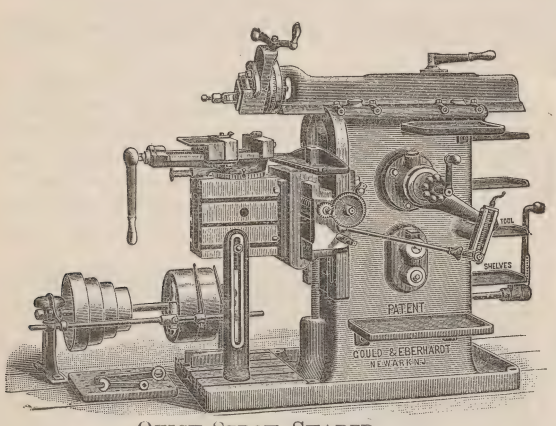
New Tools for Railroad Shops.

We illustrate herewith some new and advanced tools which are found largely in the largest railroad shops, as well as shops manufacturing motors for electric street railways. They are made by Messrs. Gould & Eberhardt, of Newark, N. J. The drill press shown is a machine which embodies many original and important features. Its design is such that although simple, it is of very strong construction. It has indexes for telling the operator at what speed and feed to run the machine for the various sizes of drills. These indexes are large so that any person interested can tell at a glance although standing some distance away from the machine, whether the operator has the proper speeds. The back gears are so arranged that one movement of the lever releases the cone from its shaft and engages the gearing or *visa versa*. The feed is entirely independent of the drill spindle, and changing the speed of the drill, does not affect the feed. It is also provided with an automatic stop for disengaging the feed. The drill is driven with a tool steel pin with a groove milled in which fits the drill shank. This also acts as a drift to remove the drill from the spindle and avoids the lowering of the drill spindle. On the 32-inch and larger sizes the table is raised and lowered by bevel gears and a screw placed under the center of weight of table arm.

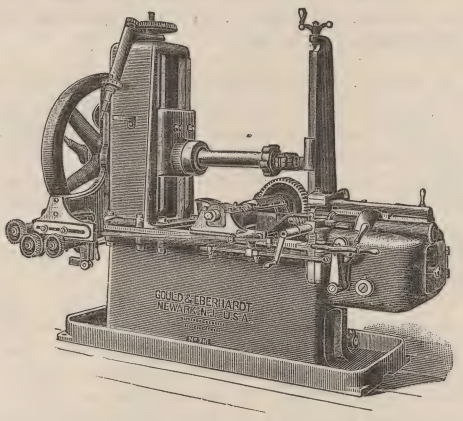


IMPROVED DRILL PRESS.

The shaper illustrated possesses many essential features which make it especially adapted for railway works. It is operated by a new crank motion which gives a positive length of stroke. By means of this motion the usual number of strokes in such machines can be doubled on short work. The details of this machine are also worked out very closely, and embody many conveniences which are appreciated by the practical man. It has a large variety of ways for holding work. For instance, the vise has projecting jaws to hold long work when planing off the ends of punches, rods, etc. A pair of adjustable centers are furnished a set of jaws for holding taper work, and an extra face plate which can be fastened quickly in place of the vise. The vise has a graduated base; also means for locking the vise in three distinct positions, at right angles to each other, or the vise as well as the table can be removed and work fastened to the side of the table, or to the slide if desired. The



QUICK STROK SHAPER.



AUTOMATIC GEAR CUTTER.

machine has also a large base or foundation, with an extension and support to the work table. This makes a rigid construction and one capable of taking heavy cuts without springing, and thus produces accurate work.

The automatic gear cutter is a product of modern necessity. Since the extensive introduction of the electric system on street car lines, this new type of machine has been built especially adapted for the cutting of teeth in gears, as required on the trucks. The machine is very rigid, and capable of forcing the cutters all they will stand. It has an oil pan and pump for supplying a lubricant to the cutter when cutting steel. The slide has a very quick return so that little time is lost when the machine is not cutting. An idea of the capacity of this machine can be had when it is stated that 10 to 12 gears of cast iron, 23 inches diameter, 4½ inches face, 3 pitch, can be cut per day of 10 hours.

Tammas had a friend stopping with him during the holidays, and took him up to the Hill of B—— to have a look round. Arriving at the seat, they sat down, when his friend remarked: "Here we have come up to view the beauties of nature and I have come away without a glass" [telescope] to which Tammas made answer, "Dinna fash yersel' about a glass, 'cause I can just as weel tak' a sook oot o' the bottle." —*Dundee News.*

An exceedingly useful combination lift, push and haul jack and box spanner is manufactured by Alfred Field & Company, of New York. It is designed to combine great power with light weight. The screw, which has both right and left thread, is of steel, and the heads are of malleable iron. The form of the heads and the manner of their working adapts the jacks for raising, adjusting, suspending, stretching, cramping, etc. Each head has a V groove for use in lifting or bending shafting. The right and left screw gives double the speed of a single screw, and the heads are arranged to form a box spanner. They are made in two forms, with and without ratchet. The lifting capacity is from 6 to 36 tons.

A Scheme That Did Not Work.

The messenger was indeed a busy man. Freight lay topsy-turvy and helter-skelter, while he was doing his best to get it into shape. After he had arranged it as best he could, he sat himself on his packing chest to rest and cool off and meditate, says the *Express-Gazette*. But his meditations were suddenly interrupted. An elongated, comical, yet sprucily dressed individual sauntered to the car door, smiled on him, and said, "Good morning."

"Good morning, sir," answered the messenger." I see you have a coffin in your car," said the stranger with a whimsical leer. "Yes sir, I have," answered the messenger. "Are you in any way connected with it?" "Well, I should say so. I shipped that supposed corpse." "What's that you say?" asked the messenger, jumping up in surprise. "Supposed corpse? Look here, my friend, this company takes only real corpses, and if that is only a supposed corpse, out the door he goes." "Don't get excited, my friend," said the stranger calmly. "I want to let you into a little secret, and when I am done explaining it to you, a discovery will be made that I am a benefactor, and you won't make the least objection to the supposed corpse." "I don't know whether I will or not," replied the messenger. "Oh, I know you won't," chuckled the stranger, "because the thing is being done for the man's good. At the same time it contains humorous features that will excite your risibilities. Now just give me your kind attention, and I will give you the facts in the case as briefly as possible. It is unnecessary for me to state that I am a gentleman of excellent and exemplary habits. You can see that by the cut of my jib. I am of a very amiable and loving disposition; but, sir, although I hate to confess it, I have a brother who is of a very different character. In short, he loves to monkey with the flowing bowl, and gets beastly drunk. He attended a banquet to-day at which I was the honored guest, and he disgraced me by tanking up to the full extent of his capacity. I consulted with some of my guests, who were my most intimate friends, and we decided that as all other things had failed, including Keely cures, we must frighten him in such a way that he would give up the evil habit then and there. So, while he was lying in a stupor, we got that long pine box over there, put a few air-holes in it, nailed on the lid, and then hailed a man with an express wagon and put the box aboard. Now, my friend, you know the rest. That's my brother in the box, and he's dead drunk. All the express charges have been paid. Keep an eye on him, and should he sober up before he gets to destination, take off the lid and tell him he was supposed to have died. Then he will realize his position, and I'll stake all my dough, he will never take another drop the longest day he lives. Now, if ——" A movement in the box cut short further utterance, and they both looked and waited for further developments. Developments came in the shape of a tremendous bang, like as if the corpse was using his head for a battering ram. "Gracious, he will get out himself," cried the excited brother. "I'll get out of sight, but will keep near, so I can hear all." And then the long, slender stranger moved from range of vision. Bump, bang, crash and the lid of the coffin flew off, and the supposed corpse sat up, and after leering round said: "Great suffering Jehosaphat! Where am I?" "You are dead, sir," replied the messenger in a sepulchral tone. "Where did you say I was?" asked the corpse in a thick voice. "You are in the other world, my good man." "And where are you, then?" "Oh, I am in the other world, too," answered the messenger. "Say, how long have I been dead, anyhow?" pleaded the supposed dead man. "Oh, about three weeks." "How long have you been dead?" "Four months." "Well, then, old fel, you know the location of things better than I do, having been here so much longer. Can you tell me where I can get a good, stiff drink of brandy" With this remark the lively corpse stepped out of his close confinement, and went to the car, and looked out, and then, with a smile on his face, he turned to the messenger and said: "It is not necessary, sir, for you to tell me where to obtain the needed potion. I see a sign over there that reads, 'A schooner for five cents.' I guess they've got whisky there, too. Good day, sir." And with a polite bow he gingerly let himself down from the car. The messenger looked out, and he beheld the benefactor, who had sought to save his brother from the flowing bowl, walking away slowly, and sadly shaking his head, while the supposed corpse disappeared in the saloon door.

Dixon's silica-graphite paint is becoming very popular wherever used for roofs of all kinds, bridges and other structures, and for all places where a dark-colored paint can be used. It covers twice as much surface as some mineral paints and lasts four to five times longer. It lays and holds to old paint as well as to new work, and as a priming coat is said to be very superior. Roofs well painted with it have not required repainting in ten to fifteen and even twenty years. It is made by the Joseph Dixon Crucible Company, of Jersey City, N. J.

A New-Fangled 'Bus.

The Memphis *Commercial-Appeal* relates the following anecdote of an Arkansas countryman who visited that town, and when ready to return to the depot entered what he supposed was a new-fandled 'bus, but which was in reality a lunch cart. He stepped insided and waited for the vehicle to start. He looked with some suprise upon the lunch outfit, and said to the man behind the counter:

"I thought we could give you fellers across the river points on new schemes, but, by ganny, you beat us all out. Never saw a 'bus before where they served lunches en route. What's the fare?"

"Oh, we've got frankfurters, coffee, sandwiches, etc." replied the proprieter.

"I mean what does it cost to ride?"

"Ride where?" blankly queried the astonished proprietor.

"Well, I'm looking for the Memphis and Little Rock depot. Go anywhere near that?"

"Guess you've made a mistake," said the proprietor. "This is a lunch cart, and I ain't going to move away from this stand for hours yet."

"P. & B. Ruberoid" Car Roofing.

The Standard Paint Company informs us that its P. & B. Ruberoid car roofing is meeting with marked success wherever introduced. It seems to suit everyone. It is said that owing to its pliable and elastic nature it will stand more wear and tear and racking of a car than anything in the market. This roofing has as a foundation the best felt manufactured, which is thoroughly saturated with the P. & B. water and acid proof composition. It is a perfect non-conductor, and is not affected in any way by changes of temperature. It is put up in rolls 60 inches wide, each roll containing sufficient material to cover a car roof; is easy and clean to handle, and is without odor. It does not require tar, pitch or paint at seams.

The Standard Paint Company also makes a speciality of P. & B. Paints which are largely used by railroads for preserving iron work, etc., subject to the action of locomotive fumes, and gases.

The Company has offices at No. 2 Liberty Street, New York, and has recently issued a very handsome sample book and catalogue, being one of the most complete things of its kind ever offered practical railroad men, to whom it is free until the supply is exhausted.

Messrs. Jenkins Bros., of 71 John Street, New York, makers of the well-known Jenkins valves and packing, have issued a new illustrated catalogue of the exceedingly wide variety of valves, packing, washers, and numerous other steam engine appliances they make. Those interested in securing the latest improved and most efficient appliances of this kind should send for one of these pamphlets and examine the contents.

As an evidence of the increasing prosperity among railroads and those engaged in the manufacture of railroad rolling stock, the J. A. Fay & Egan Company, the justly well-known manufacturers of car and railway wood working machinery, report an increasing business in this line. This company is now furnishing machinery for the Mexican International, the Illinois Central (for its new shops at Burnside, Ill.), the Queen & Crescent and the Big Four; also the Missouri Pacific, and the Jacksonville, St. Augustine & Indian River railroads. It has recently equipped the new shops of the Baltimore & Ohio Southwestern at Washington, Ind., also shops of the Pittsburgh & Lake Erie, Kansas City & Gulf, Mobile & Birmingham, Lenoir Car Company (at Lenoir City, Tenn.), New York Central (Utica shops), and a number of others. An increased trade in this direction is expected for some time to come.

Our Directory

OF OFFICIAL CHANGES IN SEPTEMBER.

We note the following changes of officers since our last issue. Information relative to such changes is solicited.

Atchison, Topeka & Santa Fe.—Receiver Joseph C. Wilson died Sept. 18.

Boston & Maine.—Geo. L. Ferguson succeeds W. H. Sterns as Division Master Mechanic at Springfield, Mass.

Cincinnati Southern.—General Manager Richard C. Carroll has resigned and the office is abolished and the duties assumed by Receiver S. M. Felton.

Interoceanic of Mexico.—General Manager Edward W. Jackson died Sept. 2. W. Cockfield is appointed Master Mechanic at Puebla, Mex.

New Jersey & New York.—Thomas B. Russum is appointed Assistant Superintendent and Master Mechanic.

New York & New England.—Name changed to New England Railroad Company. President, George B. Schley; Vice-President, Gordon Abbott; Second Vice-President and General Manager. J. T. Odell.

Northern Pacific.—Receivers Oakes, Payne and Rouse have resigned, and E. W. McHenry and F. G. Bigelow succeed them.

Ohio Southern.—General Superintendent J. H. Barrett has resigned and the office is abolished. C. H. Roser is appointed Superintendent.

Plant System.—Vice-President H. S. Haines has resigned.

Pittsburgh, Akron & Western.—Name changed to Northern Ohio. General Manager Geo. L. Bradbury, of the Lake Erie & Western, is appointed General Manager.

Santa Fe, Prescott & Phœnix.—O. H. Jackson is appointed Master Mechanic. Office at Prescott, Ariz.

Southern Pacific.—J. Kruttschnitt is appointed Second Vice-President and General Manager.

Velasco Terminal.—L. L. Foster is elected Vice-President and General Manager, with office at Velasco, Texas.

Wheeling & Lake Erie.—Robert Blickensderfer is appointed General Superintendent, and F. J. Stout is appointed Superintendent, with offices at Toledo.

Employment.

WANTED—With a reliable and progressive house, catering to the railroad trade, a position by a steady and sober young man who has traveled and sold goods to other trade, and also has a general and practical knowledge of mechanics, and possesses executive ability to handle men and work to best advantage. Best of references. Address "H.," NATIONAL CAR AND LOCOMOTIVE BUILDER, Morse Building, New York.

NATIONAL CAR AND LOCOMOTIVE BUILDER

NOVEMBER, 1895.

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The Grand Trunk has ordered 1,000 new box cars.

The Portland & Rochester will shortly order 20 cars.

The Omaha & St. Louis has ordered 500 new box cars.

The Maine Central is in the market for 1,000 new coal cars.

The Michigan Central is about to order 1,000 new freight cars.

The Wheeling & Lake Erie is in the market for 100 coal cars.

The Baltimore & Lehigh has let a contract for building 300 cars.

The New York, Lake Erie & Western has ordered 1,000 new cars.

The Pittsburgh, Shenango & Lake Erie has ordered 500 new cars.

The Ohio River Railroad is about to order six new locomotives.

The New York, Ontario & Western has ordered 250 new coal cars.

The Mexican Central is going to add 60 coal cars to its equipment.

The Alameda & San Joaquin has ordered 40 flat cars of 30 tons capacity.

The Lehigh Valley is about to order 2,000 box and 50 platform cars.

The Gulf & Interstate Railroad of Texas has ordered two new locomotives.

The Pennsylvania Railroad, it is announced, has ordered 350 40-tons capacity cars.

The Southern Railway Company, it is announced, is in the market for 3,000 cars.

The Calumet & Blue Island has ordered 100 platform and 50 hopper-bottom coal cars.

The Pennsylvania Railroad is building at its Juniata shops 25 new class P engines.

The Ohio Southern has just ordered six locomotives from the Brooks Locomotive Works.

The Boston & Maine is reported to be in the market for about 1,000 cars of various types.

Up to Oct. 1 the Baldwin Locomotive Works had built, since organized, 14,500 locomotives.

The Atlantic Coast line is reported to be in the market for the construction of 1,500 freight cars.

The Lehigh Valley has ordered from the Baldwin Locomotive Works 20 10-wheel freight engines.

The New York, New Haven & Hartford has ordered two Russell snowplows for use on the Old Colony.

It is reported that the Louisville & Nashville will build 400 freight cars at its shops at New Decatur, Ala.

The Chicago, Milwaukee & St. Paul is to build 200 standard 34-foot box cars at its shops in Milwaukee.

The Wheeling & Lake Erie, it is said, will be in the market for a number of new locomotives about December.

The New York, New Haven & Hartford has ordered 2,100 new cars. The cars are to be box and side dumping cars.

The Duluth, Missabe & Northern has about decided to increase the order recently announced for 200 ore cars to 500 cars.

The Kansas City, Pittsburgh & Gulf has ordered 10 new furniture cars. The company is now in the market for 200 box cars.

The gross earnings of the Wabash Railroad for the first week of October were $286.458, an increase of $33,172 over the corresponding week in 1894.

The Norfolk & Western is about to order 100 hopper gondola cars of 60,000 pounds capacity, to be equiped with Westinghouse air brakes and automatic couplers.

It is stated that the Cincinnati, Portsmouth & Virginia has purchased three new freight engines, and is also negotiating for the lease of four additional engines.

The New York, Ontario & Western has placed its shops in Middletown, Oswego and Norwich on full time. For more than two years the men have had a hard time.

The Ann Arbor has issued specifications for 725 cars. Twenty-five of these cars are to be large sized furniture cars, and the other 700 will be box cars of 60,000 pounds capacity.

Wagner sleeping cars are to begin running between Atlanta, Ga., and Columbia, S. C., over the Georgia and the South Carolina & Georgia railways. These will be the first Wagner cars run in the far South.

The National Tehauntepec Railroad has ordered 150 freight cars. The contract was given recently by Mr. Samuel Hermanos, of New York City, who has the contract for completing the equipment of this road.

The large storehouse at the Bushnel Manufacturing Company's car seat works, at Easton, Pa., was injured by fire on Oct. 10. The estimated loss on the building and stock is $10,000, which fortunately is covered by insurance.

The Atchison, Topeka & Santa Fe is to build car repair shops at Argentine, Kan. One building, 120 feet by 280 feet, will be put up now and a car-wheel foundry will be added later. The present roundhouse will be much enlarged.

The Plant System has undertaken to run a store car over its lines to supply its employes with the ordinary necessaries at 10 per cent. above cost price. Of course the local merchants along the road are offering considerable opposition

The Chicago, Burlington & Quincy has an unsurpassed passenger service. One of its daily trains between Chicago and Council Bluffs makes the run of 500 miles in 10 hours. Deducting the time of stops makes the average speed of about 62 miles an hour while running.

The Fall Brook Railway has placed in service 250 coal cars just received from the Union Car Co., of Depew, N. Y. They are double hopper cars of 60,000 pounds capacity, and are equipped with the Fox trucks, Gould couplers, Westinghouse air-brakes and all late improvements.

A railroad ferry line has been established between Copenhagen and Malmo, in Sweden, by means of which a tourist can now travel all the way from Cadiz, in Spain, or Constantinople, in Turkey, to the northernmost point of Norway and Sweden without leaving the train.

The Government crop report for October indicates a yield of 424,000,000 bushels of wheat, 2,300,000,000 bushels of corn and 825,000,000 bushels of oats. The oat yield, it is estimated, will be about 75,000,000 bushels larger than any crop of the cereal raised heretofore in this country.

Our English friends seem to be sharing in the general revival of business. The men in the Crewe shops of the London & North Western are now required to work on Saturday. They have been on short time for over two years. It is expected that the whole of the force, 7,000 in number, will soon be placed on full time.

The employees in a number of departments in the Pennsylvania shops at Altoona have been working twelve hours per day recently in order to hasten new work and keep up with repairs. On Saturdays both foundries, the two erecting shops and the machine, vise and cab departments work all day, something very unusual.

The St. Louis Southwestern has just completed at its Pine Bluff shops a heavy six-wheel connected switch engine, the weight of which on the drivers is 100,000 pounds; cylinders, 18 by 24 inches. The frame is said to be of cast steel, cast in a single piece about 23 feet long, by the American Steel Foundry Company, of Granite City, Ill.

General Manager Kendrick, of the Northern Pacific, has done a good deal of work in reducing grades on that road. Carefully made estimates of such work show that on this road an annual net saving in operating expenses of about $500,000 may be made by expending $1,500,000. This represents an interest of about 33 per cent. on the investment.

Articles of incorporation have been filed at Cheyenne, Wyo., for the California, Idaho & Montana Railroad Company, which proposes to construct and operate a railroad from Butte City, Mont., to San Francisco. The capital stock is $30,000,000. Among the incorporators are Moritz Lippmann, of New York; Theodore Voorhees, of Philadelphia, and H. M. Dickey, of Chicago.

A broken axle on an eastbound freight train on the Pennsylvania Railroad threw several cars in front of a westbound mail train near Newport, Pa., Oct 24. The mail locomotive and four mail cars went over a high embankment, caught fire and were destroyed. The engineer and fireman went over with the engine and were killed. A large amount of mail matter was destroyed.

The Vandalia Line has recently received four new Schenectady 20 by 24-inch eight-wheel passenger locomotives for use on the heavy fast trains between Indianapolis and St. Louis. The engines weigh about 129,000 pounds and have exceptionally large boilers, built for carrying 190 pounds steam pressure. The driving wheels are 73 inches in diameter and the centers are of cast-steel.

The Pennsylvania has just ordered the construction of 500 gondola cars, which are to be turned out of the company's shops at Altoona as quickly as possible; also 500 similar cars of an outside shop. The company has just turned out of the Altoona shops 77 dairy refrigerator cars, and in connection with the gondola cars has ordered 75 more dairy cars, which are also to be completed as rapidly as possible.

At the Baldwin Locomotive Works business is reported to be better than it has been for some time past. About 3,500 hands are finding steady employment and the works are running on full time. Among the orders at present in course of fulfillment are one for 40 locomotives for a Russian railroad, another for 10 compound locomotives for the Chicago, Milwaukee & St. Paul, and another for 10 locomotives for the Duluth & Iron Range.

The Santa Fe Railroad put into effect October 29 a new time card, which lowers the best time heretofore made between Chicago and Los Angeles by half a day. The new train leaves Chicago at 6 o'clock in the evening, daily, arriving at Los Angeles at 6:30 o'clock the third day. It is known as the "California Limited," and will practically be a counterpart of the fast limited trains between Chicago and New York, although no extra charge will be made for passage.

The general census of the population in the Republic of Salvador has just been finished, showing the country to possess 816,000 inhabitants. Census figures recently obtained in the Argentine Republic show that the population of the city of Buenos Ayres is 665,243, and that of the province of that name 921,232. Without counting the new territories of the Pampa, Chaco and others the census indicated a population of 3,873,626 inhabitants in the Argentine Republic.

The Buffalo Traction Company was incorporated in Buffalo, N. Y., Oct 28, to construct a street surface railroad 66 miles in length, to be operated by electricity. The road is to be constructed from the Buffalo city line, at South Park, and from the city ship canal in the Hamburg turnpike to the Buffalo city line in O'Neill street, and across the city of Buffalo to the Pine Hill road, in the town of Checktowaga, which places will be its termini. The capital is $3,000,000.

A car unloading apparatus recently put in service at Cleveland is a large cylinder through which the track is run, the loaded car entering at one side. It is then firmly fastened immovably by hydraulic clamps within the cylinder, which is then simply rolled over, precipitating the coal into chutes, delivering it equally into two of the steamer's hatches at once. The cylinder is then righted, the next loaded car being pushed along into it, running the empty one out on the other side.

The Southern Railway has issued a very neat and tasty folder, invititing everybody to come to the "Cotton States and International Exposition, via the Southern Railway." There is nothing extraordinary in the appearance of this circular when folded up, but, upon examining it more closely, the inside pages are found to be printed in thirteen different languages. The circular also contains excellent half-tone engravings of the principal exposition buildings, and is a credit to the passenger department of the road.

A northbound passenger train on the Missouri, Kansas & Texas Railroad was held up by two masked men near Temple, Tex., Oct. 15. The robbers uncoupled the express car from the train and compelled the engineer to draw the car to a point nearly a mile away. They forced open the door of the express car and used dynamite in an attempt to open the safe. Their efforts were ineffectual, and, becoming alarmed over the delay, they finally abandoned the car and fled to the woods. None of the passengers or crew was molested.

Clear Lake in California is situated 75 miles from San Francisco and 1,317 feet above sea level. A scheme is on foot to make the creek which is its outlet run a plant for generating electricity, to conduct this to San Francisco for general utility, and to run a mountain railway and various steamboats; and, finally, after the descending force of the stream can be no further utilized it is to be used for the irrigation of waste lands. This scheme certainly contemplates making Dame Nature do about all the useful work she can with a stream of water.

There has been considerable talk about the Pennsylvania Railroad adopting a lighter type of passenger equipment for its suburban service out of Philadelphia. We are officially informed that this will not be done. The officer favoring us with the information states that: "We are not considering the building of what is usually regarded as 'light equipment' for our suburban traffic. Probably the only thing we shall do in that direction will be to see whether it is possible to make any modifications which will reduce the weight of our standard passenger coach without decreasing its strength."

The recent enforcement of the order directing that the hand baggage of passengers passing through Canada be examined by Uuited States Customs officers, without regard to whether the same was stamped or the passenger started from an American station, has been injurious to the business of the Michigan Central. Rather than suffer any further loss of traffic the company has entered into an arrangement with the Government, by which inspectors will travel on the trains and inspect baggage en route. Three special officers have been appointed at Detroit, one at Suspension Bridge and one at Buffalo. The expense is to be borne by the railroad company, which will reimburse the Government for the salaries paid. The effect of this will be to obviate detention of trains or annoyance to passengers and will be a source of satisfaction to the traveling public.

The Baldwin Locomotive Works have a contract from the Russian Government for 40 locomotives for Russian railroads. All the engines are to be Vauclain compounds, 20 being for passenger service and the other 20 for freight service. They are to be delivered with the least possible delay, and with the orders already in hand will keep the Baldwin establishment busy for the rest of the year. As petroleum is used principally for fuel in Southern Russia these locomotives will be adapted for burning oil instead of coal. The freight locomotives included in the order are to be consolidation engines, and are to be built after the standard construction of the Baldwin Works. The passenger locomotives are to be 10-wheel engines, similar to the *Atlanta*, now on exhibition at the Cotton States and International Exposition, and illustrated on another page.

A Wide-Firebox Express Locomotive.

The engravings on this and the opposite page reproduce the general arrangement and some cross-sectional drawings of one of several new standard wide-firebox passenger locomotives recently built for the Lehigh Valley Railroad by the Baldwin Locomotive Works from designs furnished by Mr. Samuel Higgins, Superintendent of Motive Power. Its total weight in working order is 212,500 pounds, of which the tender weighs 84,000 pounds and the engine 128,500 pounds; 38,500 pounds of this is carried on the engine truck, and 90,000 pounds on the drivers, making 24,000 pounds per driving wheel journal. The cylinders are 20 by 24 inches, and the boiler carries a steam pressure of 160 pounds. Anthracite coal is used. The driving wheel centers are 68 inches in diameter, and that of the truck wheels on engine and tender are 33 inches. The ordinary link motion is used for the valve gear, the ports are 17 inches long, the steam ports being 1⅜ inches wide and the exhaust ports 3 inches wide. The valves travel 5½ inches maximum, and have $\frac{1}{16}$ inch lead and $\frac{7}{8}$ inch outside lap.

The boiler is straight, 59⅞ inches in diameter, and the center line is 106¼ inches from the top of the rails. The smokebox is 61 inches long. As shown, the firebox is placed above and extends beyond the driving wheels. It is 82 inches wide inside and 119 inches long, and has 67.7 square feet of grate surface. The water spaces at the front, sides and back of the firebox are 4 inches. The boiler has 248 iron tubes 2 inches in diameter (outside) and 13 feet 6½ inches long. The heating surface of the tubes (exterior) is 1,758 square feet, that of the firebox 157 square feet; total, 1,915 square feet.

Firebox, depth at front	50¾ inches.
" " " back	47½ "
" thickness of side plates	$\frac{5}{16}$ "
" " " back "	$\frac{5}{16}$ "
" " " crown sheet	$\frac{3}{8}$ "
" " " tube "	$\frac{1}{2}$ "
" staybolts, diameter	1 "
" " pitch	4 "
Total fire area of tube openings, square feet	9.38
Heating surface, ratio to grate area	28 to 1
Ratio of exterior tube area to firebox heating surface	11.2 to 1
Exhaust nozzle (double) diameter	3½ inches
Smoke stack, smallest diameter	14 "

An iron pilot is used with the Gould coupler. Richardson balanced valves are used, also United States metallic packing for pistons and valve stems. The driving axles are of steel, as are also the side and main rods and crank pins. Phosphor-bronze is used for the eccentric straps. The cabs are made of steel, lined with wood, and have the roof ventilator shown. By riveting the domes to a base plate, as shown, which is attached to the boiler, neither the dome nor the top sheet is flanged. All staybolts are drilled with ⅛-inch holes, one inch deep from the outer end, for a tell-tale. The eight center longitudinal rows of crown stays have hexagon nuts on the lower end for security.

The tender carries eight tons of coal and 4,000 gallons of water. It is mounted on Fox pressed steel trucks, with the plates forming same ½ inch thick. The Westinghouse 9½ inch air pump is used, also the American brake, National Hollow brakebeams, Ross steel shoes and Leache's pneumatic track-sanding apparatus.

The following table presents some further information of this interesting engine:

Engine truck	Swing bolster
Journals, driving axles	8½ inches by 11 inches
" truck "	5½ " by 9 "
" tender "	4¼ " by 8 "
Wheel base, driving	7 feet 9 "
" " truck	6 " 2 "
" " total engine	22 " 7½ "
" " " tender	15 " 11 "
" " " engine and tender	49 " 10 "
Center of truck pin to center of leading driving axle	14 11½ "
Distance, center to center of cylinders	77 "
Piston rod, diameter	3¼ "
Form of crosshead and guides	2 bar

Annual Report of the Maine Central Railroad.

The annual meeting of this company was held in Portland Oct. 16. The gross earnings for the nine months previous to June 30 were $3,525,139.48. The operating expenses were $2,192,772.15. The net earnings were $1,332,367.33.

President Franklin A. Wilson said in his report that the business revival which has prevailed to some extent throughout the country has been felt in a gratifying degree during the last six months upon the Maine Central system.

"The industries which our company has done so much to foster, and which have in turn contributed so much to our prosperity, but have been more or less prostrated during the past few years, have again become to a noticeable degree centers of activity, and new plans and schemes for the development of the natural resources of the State are being pushed on every hand. Our road is in good condition for business, and if we get it we stand ready to carry out plans for the permanent improvement of our property, which adverse pecuniary conditions left in abeyance."

American and French Travel Compared.

President Depew, of the New York Central, in speaking recently of European railways, said: "The government controls the French railways, and is very proud of its 'train de luxe,' which leaves Paris twice a week for the Pyrenees. It is the best equipped and the fastest they have. The distance from Paris to Lucon is only a few miles different from that between New York and Buffalo. My boy and I tried it. We had 170 lbs. of baggage and two berths in the sleeper. They have no double berths. The fare, the sleeping car and the extra baggage cost $78. The time occupied was 16 hours. The same service on the New York Central between New York and Buffalo costs $23, and the time required is only 10 hours."

The officials of the Pennsylvania Railroad have under consideration the re-building of the repair shops at Wilmington upon an extensive scale.

On Oct. 23 it was announced that the West Virginia Northern Railroad had abandoned all trains but one a day because water could not be procured for locomotives.

There is such a large surplus of potatoes and grain in Minnesota and North and South Dakota that for sixty days the Northern Pacific, Great Northern and "Soo" lines will, it is stated, give farmers a half-rate on carload shipments of cattle and hogs from St. Paul and Minneapolis to points in these States. The railroad companies desire that the surplus potatoes and grain be fed to stock, and this reduction is intended to encourage such practice.

Master Car Builders' and Mechanics' Conventions for 1896.

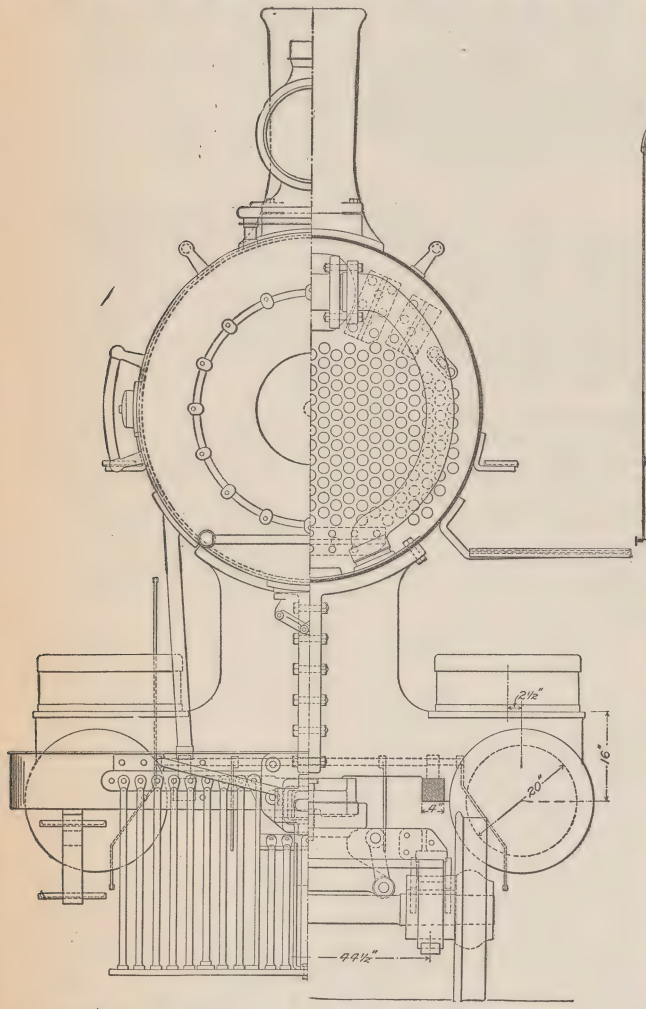
The joint committee of the Master Car Builders' and Master Mechanics' Associations, having decided on Saratoga Springs as the place for their next conventions, the committee of arrangements has selected Congress Hall as headquarters, and has made the following terms with Mr. H. S. Clement, manager:

Single rooms	$3 per day.
Double rooms, one person	4 "
Double rooms, two persons each	3 "
Rooms with bath, two persons	8 "
Rooms with bath, one person (each)	5 "
Private parlors	8 "

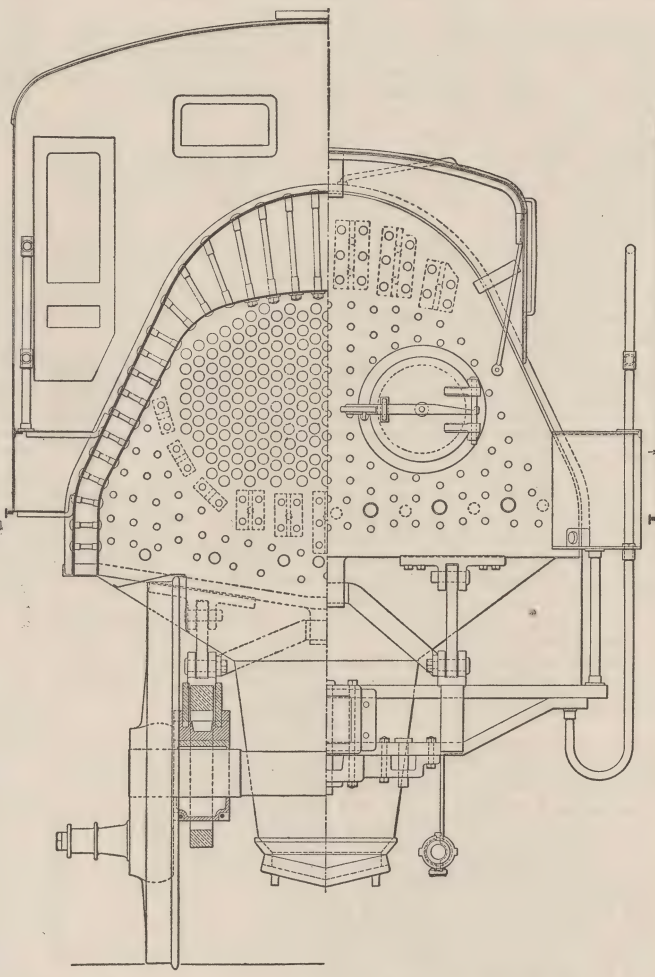
These rates are for members of the association and their friends. Members of the associations will have preference of rooms until March 1, 1896. Space for exhibits will be free to guests of the hotel. Applications for rooms should be made to H. S. Clement, Manager of the Congress Hall, Saratoga Springs, N. Y. The committee requests that members should apply at once for rooms, as those who first apply will be best served.

The executive committees of both associations have agreed to postpone the conventions one week later than the by-laws indicate. The American Railway Master Mechanics' Association's convention will meet on Monday, June 22, 1896.

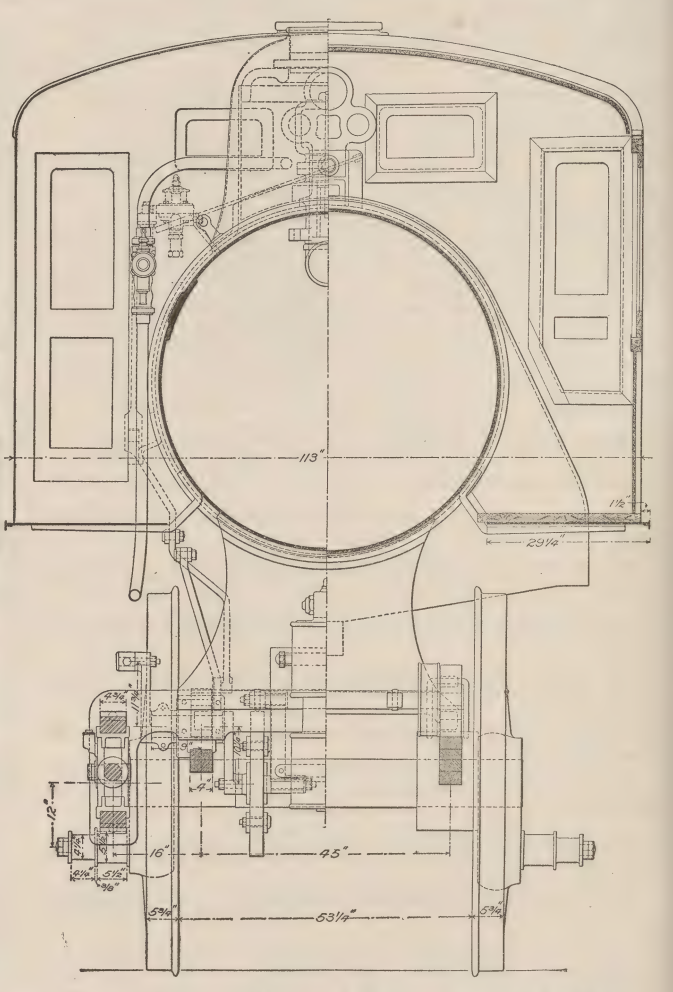
The Committee of Arrangements consists of Messrs. R. C. Blackall, D. & H. Railroad, Albany, N. Y.; John S. Lentz, Lehigh Valley Railroad, Packerton, Pa.; S. A. Crone, New York Central Railroad, New York; J. W. Marden, Fitchburg Railroad, Boston, Mass., and John Medway, Fitchburg Railroad, Boston.



Half Front Elevation and Half Cross-Section through Smokebox.



Half Cross-Section through Firebox and Half Rear Elevation.



Half Cross-Section in Front of Dome Looking Backward, and Half Cross-Section through Cab Looking Backward.

Sale of the Santa Fe.

It is announced that the Atchison, Topeka & Santa Fe Railroad will be sold on Dec. 10 in Topeka, Kan.

Among those mentioned for the presidency are D. B. Robinson, the present Vice-President of the company and General Agent for the Receivers; E. T. Jefferey, President of the Rio Grande; Aldace F. Walker, Receiver of the Santa Fe; Thomas P. Fowler, President of the Ontario & Western, and A. A. Robinson, President of the Mexican Central.

A Train Wreck in Paris.

On October 22 a train from Granville, in Manche, entered the Mont Parnasse station, in Paris, at full speed, owing, it is said, to the failure of the brakes to work. The train crashed through the platform and the wall of the station, and the locomotive and tender fell thirty feet into the Place de Rennes, killing a woman below and narrowly avoiding falling on a horsecar and three omnibuses, all of which were somewhat damaged by falling wreckage.

The passengers on the train were badly shaken up. Many of them sprang screaming from the cars, adding to the great excitement caused by the accident. Fortunately no one save the woman mentioned was seriously hurt.

The property of the Ann Arbor Railroad was mortgaged for $7,000,000 at Toledo, Oct. 18, in favor of the Metropolitan Trust Company, of New York.

Master Car-Builders' Association Circular.

Location of Air Brake Cylinders on Freight Cars.

The following circular of inquiry has been issued by the committee on the above-named subject:

The committee believes that all members fully appreciate the importance of this question, and asks all members of the Association to assist the committee as far as possible by answering this circular at an early date, and giving any and all data which may be beneficial to the committee and assist it in making report.

1. What in your opinion is the best location for air-brake cylinders and reservoirs on following classes of cars, having in view easy access for cleaning and repairing, as well as protecting air-brake apparatus as much as possible in case of derailment: Hopper bottom coal cars, box and stock cars, drop bottom gondolas, straight bottom gondolas?

2. Do you recommend that cylinder be located low enough so that rods will clear needle beams, or do you recommend cutting passage through needle beam for rods?

3. Do you consider it an advantage in regulating the braking power to have the rod from the cylinder lever to truck lever stand parallel with the car? Also, give your opinion as to the necessity for having the rod between the cylinder and floating lever stand in a line parallel with the car.

4. What distance would you recommend between needle beams and cylinders to give easy access for repairs and cleaning? What distance between triple valve and needle beam?

5. What in your opinion is the best practice in applying release valves on coal cars?

6. Has your experience demonstrated whether the water dropping on apparatus after passing through the coal on coal cars has any damaging effect on the brake apparatus by reason of the chemical properties in the coal?

7. Please give drawing, sketch or any other information on the subject which in your opinion might aid the committee.

Please send your answer to the chairman of the committee, Jas. Macbeth, M. C. B., New York Central Railroad, East Buffalo, N. Y.

JAS. MACBETH, ROBT. GUNN, H. C. MCCARTY, B. HASKELL, F. B. GRIFFITH, A. C. ROBSON, JOEL WEST, Committee.

EAST BUFFALO, N. Y., Oct. 18, 1895.

Exhibit Car, Northern Pacific Railroad.

In our last issue we published a short general description and presented exterior and interior photo-engravings of the exhibit car employed by the Northern Pacific Railroad to give the people in the Eastern States information of the agricultural and mineral resources of the States traversed by the road named: Minnesota, North Dakota, Montana, Washington, Oregon and Idaho. We have been favored with the following information relative to constructive details of the car by Mr. John Hickey, Superintendent Motive Power, Machinery and Rolling Stock of the Northern Pacific.

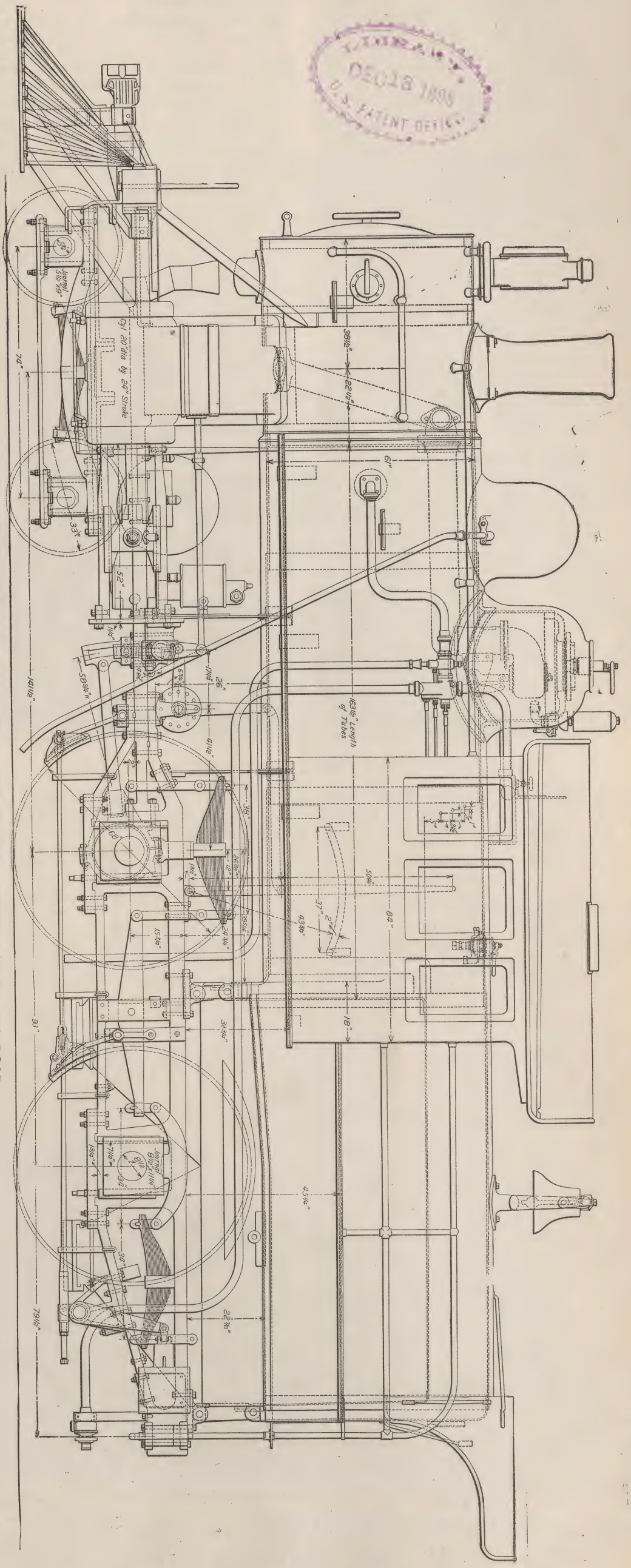
The length of the body over the frame is 61 feet, and the width is 9 feet 10 inches. The length over the platforms is 68 feet, 2⅓ inches instead of 72 feet, as stated in our previous description, and the width of platforms is 3 feet 2 inches. The inside length is 60 feet 2½ inches, and the inside width is 9 feet ½ inch. The following table gives some further information about detail dimensions:

Height from floor to elevation sill	7	feet	10	inches.
Height from floor to ceiling at center of car	9	"	6½	"
Six longitudinal sills	5	inches by	8	inches.
Two longitudinal sub sills	3	"	" 8	"
Two combination end sills	8	"	" 8	"
Floor bridging	1¾	"	" 8	"
Draft timbers	3¾	"	dbl.	plid.
Platform timbers	3¼	"	"	"
Body posts	1¾	"	by 8	inches.
Corner posts	5½	"	" 5½	"
Door posts	5½	"	" 5½	"
Body braces	1¾	"	" 6	"
Double fluted siding	¾	"	" 3	"
Double beaded lining	¾	"	" 5⅛	"
Double beaded ceiling	½	"	" 3	"
Four iron body bolsters	⅞	"	" 8	"

The car has Gould platforms and a Gould vestibule at one end. The flooring is of double quarter-sawed yellow pine, ⅞ inch by 5⅓ inches, the first course being laid diagonal and the top course laid longitudinal. A double white pine deafening floor is used, the first course being cut between the sills and the second course laid on the lower edge of sills crosswise of car. The end doors have circular heads and drop sashes. Two bay windows were at first located on each side 11 feet 4 inches from the ends, but these bay windows have now been removed from the car, and windows substituted, placed flush with the sides, in order to enable the car to clear tunnels, bridges, etc., on the different lines over which it passes. In addition to these there are four extra large windows on each side with single plates of glass 34 inches by 40 inches.

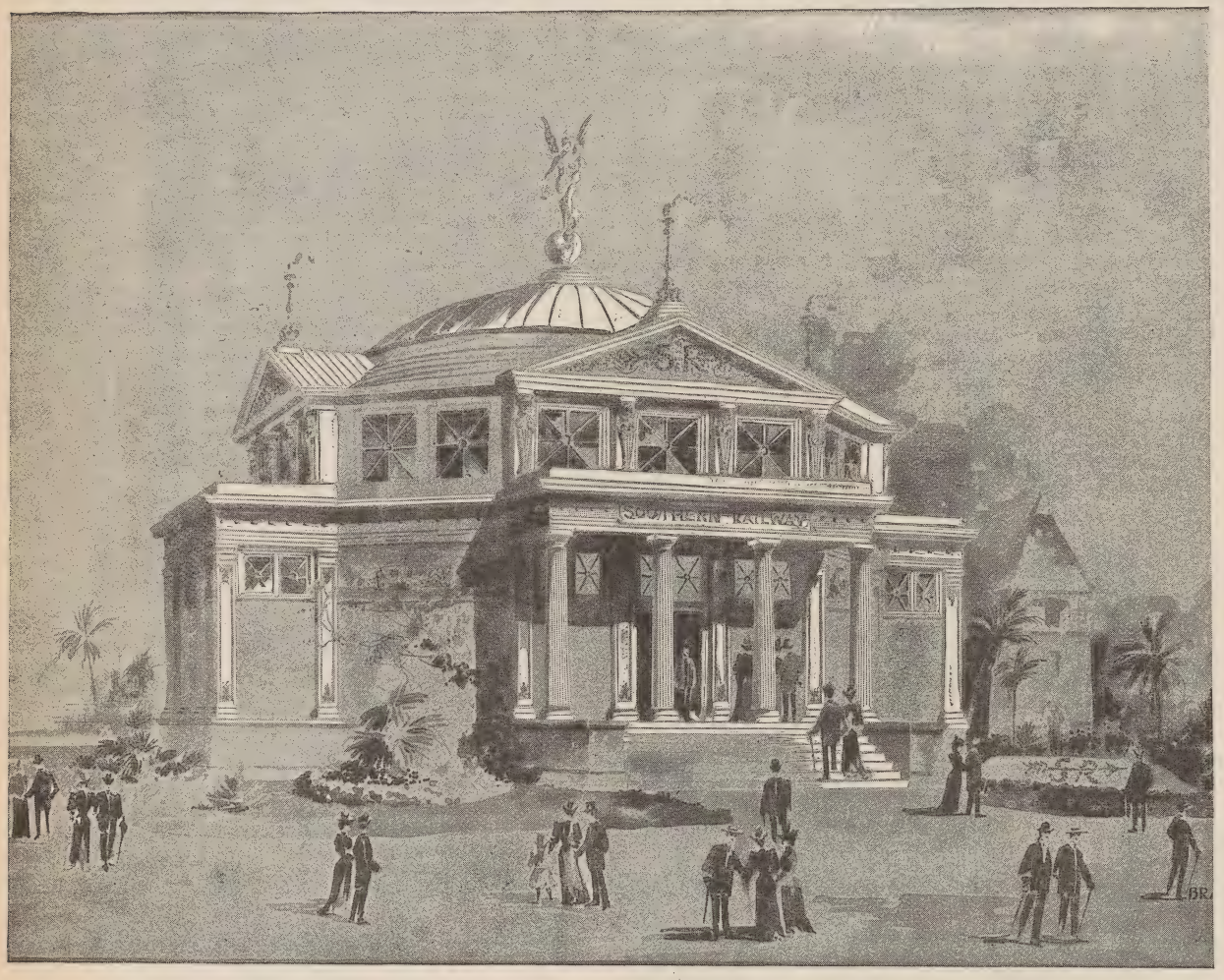
The car has an office 20 feet long and 9 feet wide. The interior of the office is finished in different kinds of woods taken from forests on the line of the Northern Pacific. The interior of car, except office, is painted China Gloss white with moulding striped in gold. The exterior of the car is painted Pullman color, and lettered in a conspicuous manner with large gold letters shaded with vermilion red. On the panels between the large side windows in bold letters are the words, "Exhibit of Products from Northern Pacific R. R. Lands." The panels on the end doors are decorated with emblems representing sheaves of wheat. The car has one toilet room, one fire-proof Baker heater, and is provided with five bronze center lamps.

HEAVY WIDE-FIREBOX PASSENGER LOCOMOTIVE, LEHIGH VALLEY RAILROAD.



The Atlanta Exposition.

The Cotton States and International Exposition, which was opened at Atlanta, Ga., early in September, is now in its most flourishing condition, and from now on until its close offers to contemplating travelers the most interesting and instructive trip that can be taken in North America. Of course it is no such fair as the Columbian Exposition, and those who may decide to visit it should understand this in order to save themselves disappointment on reaching Atlanta. To Northern people the simple trip to Atlanta will prove highly interesting, and will serve to broaden their views and enhance their esteem for the enterprise and commercial activity of their Southern neighbors. Atlanta is easy of access from all parts of the country, being reached by railroads radiating from it in all directions. In the city itself the Southern Railway provides the best means of reaching the Exposition grounds, as it also does of reaching Atlanta from points served by this vast system. The grounds are not so hard to reach as those at Chicago were, being but four and a half miles from the center of the city, which distance is covered in about eight minutes by the very rapid and frequent double track service of the Southern Railway. The cars used in the service are similar to those used by the Illinois Central for like purpose during 1893. These will also be converted into fruit cars after the fair is over. Inside the grounds, comfortable conveyance is provided for at very reasonable rates by electric launches on the lake, and by the line of herdics we have previously mentioned that circulate about the grounds on a plank driveway.



Southern Railway Building, Atlanta Exposition.

The visitor to the fair can hardly help being pleased and delighted with the beautiful location of the grounds and with their convenient and artistic arrangements. Unlike the "White City" at Chicage, the prevailing color of the buildings of this fair is green, the roofs of all being moss green, and the bodies a grayish green occasionally relieved with white. This proves to be a pleasant and restful color, and is certainly a wise provision for the comfort of visitors, as it is well known that sight seeing at a great fair is very distressing to the eyes of most people.

The Transportation exhibit contains some fine specimens of railroad rolling stock, but it is not very extensive. Several railroads show engines and cars, and the Richmond, Baldwin and Rogers locomotive works exhibit new locomotives. The Pullman Company exhibits the same train it did at Chicago, thus intimating that the art of car building, as far as it is concerned at least, has stood still for the last two years, which, generally speaking, is happily not the case. We show herewith a photo-engraving of one of the engines exhibited by the Baldwin people.

The Seaboard Air Line has its exhibit in the Agricultural Building, and it occupies 3,500 square feet of floor space. It consists chiefly of products along its line. A striking feature of this exhibit is a relief map of the territory served by the line, and across this map a miniature train of cars is operated by an ingenious contrivance.

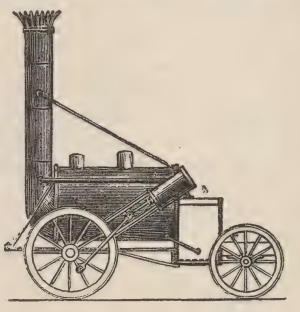
The Plant System exhibits five cars and a locomotive, the cars consisting of three first-class day coaches, a mail car and a combination baggage and smoking car. They have the Pintsch light, Baker heaters and also the heating system of the Safety Car Heating and Lighting Company. The Plant System building is one of the most attractive on the grounds. It is in the form of a pyramid, with the four sides of the building covered with the varieties of phosphate rock found along the lines of the road. Seen by electric light, it glistens like marble. In the building are collections from all parts of the territory reached by lines of the Plant System. This exhibit also includes a train of freight cars just half the ordinary size. It has an engine, a flat car, and one gondola, box, fruit and caboose car each. One idea in building this train so small was to facilitate inspection.

Oct. 27 was made a gala day at the exposition by the people of the Plant System. It was the 76th anniversary of President H. B. Plant's birthday, and officers and employees from all the railway, steamship and express lines included in the system, and numbering nearly 5,000, were in the city to celebrate the day.

The Southern Railway has one of the most notable and interesting exhibits on the grounds for railroad men. We present an illustration of its building, the exhibits of which effectively illustrate the resources of mineral and agricultural wealth of the territory it serves. In and about this building are other exhibits showing the march of improvement in Southern railroad practice during the last 40 years. The Southern Railway also exhibits a 10-wheel passenger engine, a fast consolidation engine, a new 60-foot postal car and a passenger coach, each with all modern improvements; also an improved double-felt lined ventilated fruit car. This company has spent about $100,000 on its exhibit, and the improved facilities for the local fair traffic at Atlanta, and is deserving of much commendation for its enterprise.

Demise of an Old Engineer.

Shortly after the recent races of passenger trains between London and Aberdeen, an aged man died in London to whom these races must have been of unusual interest. This was Joseph Bell, who died at the age of 83. He was, in his youth, the engineer of George Stephenson's famous *Rocket*. He was probably, before he died, the oldest railroad man living, and to him was indeed given an unprecidented experience. He had seen and had personal experience of every change and development of the carrying industry which has revolutionized the world. He heard Stephenson's prophecy that a locomotive would attain a speed of ten or twelve miles an hour. He ran the *Rocket* at 15 miles an hour on the average; reached 29 miles an hour, and made on a later occasion the wonderful "world's record" of 35 miles an hour. And he lived to see trains run for hundreds of miles at more than a mile a minute, and for shorter distances at speeds exceeding 100 miles an hour. As evidence of the fact that locomotive running is a healthy occupation, it may be stated that Mr. Bell continued in active service until about 18 months of his death, running on the London District Railway, and, finally, that he died, not of old age, but through an accident, having fallen into an open cellarway.

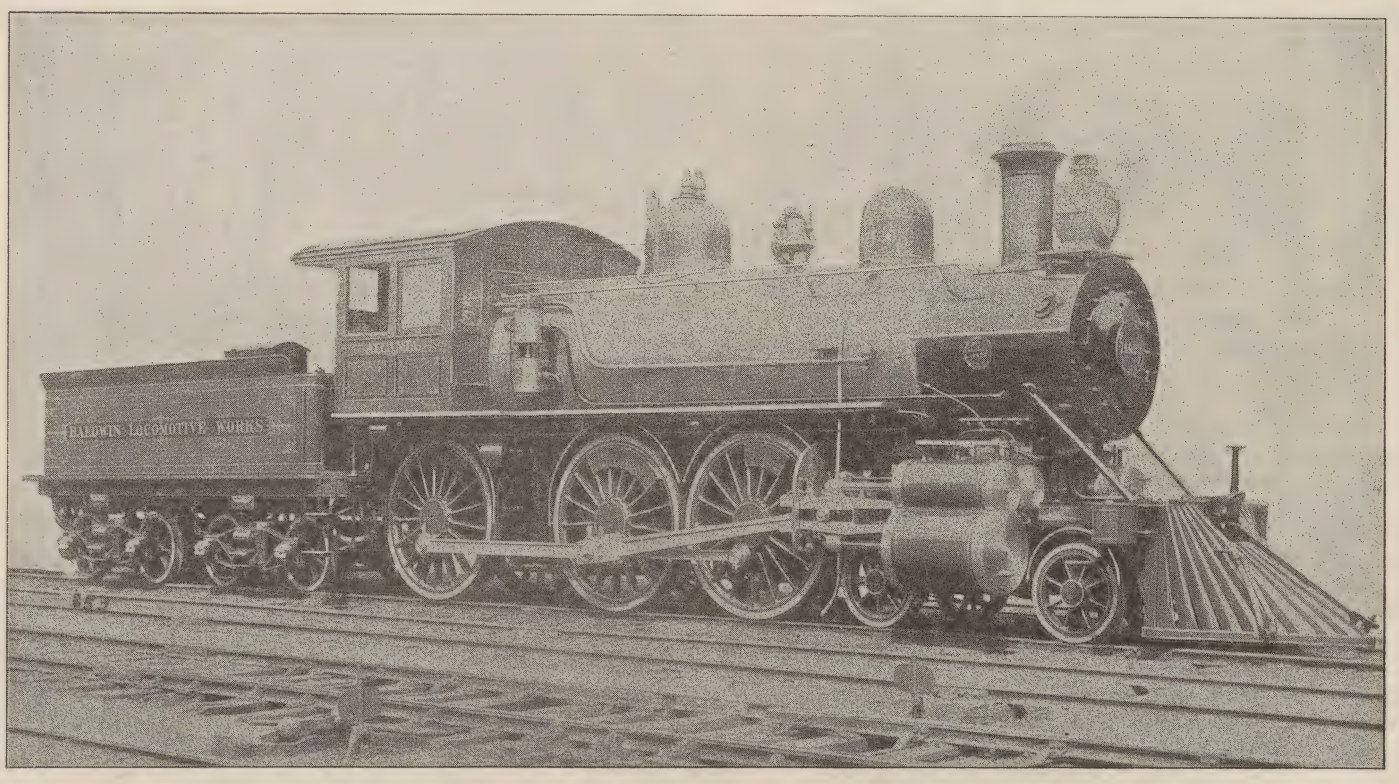


"THE ROCKET," 1829.

We present an illustration of the *Rocket*, built in 1829, and the prize winner of the memorable competition of four engines on Oct. 6 of that year for a purse of £500 on the Liverpool & Manchester Railroad. The engine weighed 4¼ tons ready for service. The boiler was 6 feet long and 3 feet in diameter, with 25 3-inch longitudinal tubes, and carried 50 pounds steam pressure.

This was not, as has been widely reported in the newspapers, the first locomotive ever built.

Fifteen years before this (1814) George Stephenson built his first locomotive, and a year later built another in which for the first time the exhaust steam from the cylinders was used to create a draft through the fire. Even these were not the first locomotives, for 10 years before Stephenson built his first locomotive Messrs. Trevithich & Vivian built a locomotive that did successful work with 40 pounds steam pressure and one cylinder 4¾ inches in diameter. Two years before Stephenson built his engine, an American engineer, Col. John Stevens, of Hoboken, N. J., expressed views on the possibilities of steam locomotives far in advance of Stephenson. He expected speeds of 40 and 50 miles an hour, and even anticipated the possibility, since realized, of 100 miles an hour.



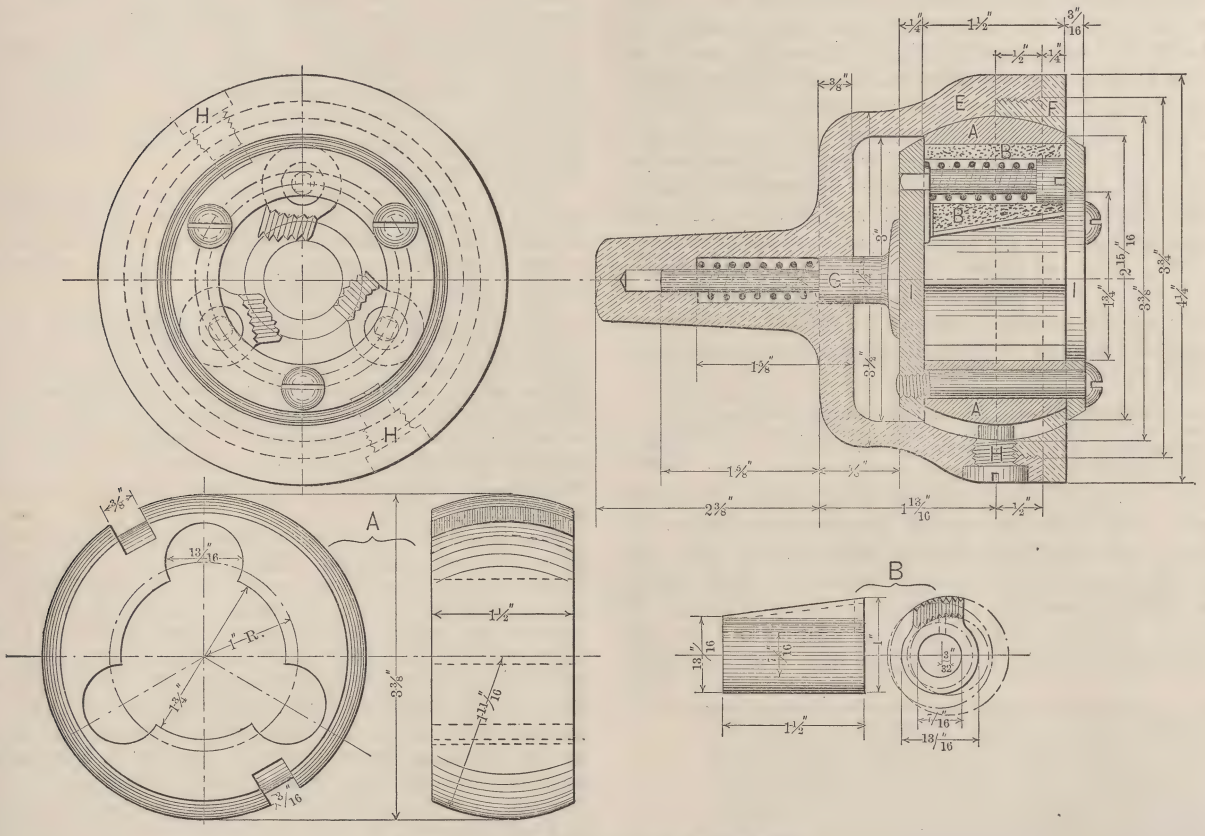
BALDWIN COMPOUND EXPRESS LOCOMOTIVE AT ATLANTA EXPOSITION.

Total weight in working order, 130,680 pounds; on drivers, 93,580 pounds; cylinders, 14 inches by 24 inches by 24 inches; piston valves; steam ports, 24 inches by 1½ inches; exhaust ports, 24 inches by 4½ inches; valves travel, 5 inches; lap, inside, none; outside, 7/8 inch H. P., 5/8 inch L. P.; area steam pipes, 19.63 square inches each; driving wheels outside, diameter, 72 inches; journals, 8 inches by 10 inches; wagon top boiler, steel, 58¾ inches in diameter; 236 two-inch tubes 3 feet 6 inches long; firebox, 34⅜ inches wide and 78⅜ inches long; steam pressure, 180 pounds; grate surface, 18.7 square feet; total heating surface, 1,824.46 square feet; smallest diameter of stack, 17¾ inches; tender carries 3,600 gallons of water and 5.5 tons of coal; total wheel base, 50 feet 11½ inches; total length over all, 62 feet 1 inch. Twenty of these locomotives are being built for the Russian Government.

A Chuck for Screwing in Stay Bolts.

The engraving herewith reproduces working drawings of a newly designed chuck for screwing in stay bolts, invented by Mr. L. Bartlett, Master Mechanic of the Missouri Pacific Railway at St. Louis, and used in the shops under his charge since July last. It is a very compact and handy tool, and has proved itself to be a time and labor saver in the work of screwing in staybolts. It is used in connection with either a steam or air driven motor, and automatically grasps a stay bolt that has been entered, rapidly screws it to place and automatically releases the bolt when the motor is stopped. It is made of steel.

We are enabled to present these drawings and following description of this tool through the courtesy of Mr. Bartlett, who gave the matter to a representative of the NATIONAL CAR AND LOCOMOTIVE BUILDER during a recent visit of the latter to the Missouri Pacific shops at St. Louis. The drawings show the construction very plainly, but the following description will make its operation very plain to our readers.



A Chuck for Screwing in Stay Bolts.

The part marked *E*, and shown in the sectional view, is the shell or frame of the tool. The part marked *F* is a nut screwing into the frame *E*, to retain in position that part of the frustum or zone of the sphere marked *A*, as shown. The office of this part, *A*, is very readily understood upon inspection of the drawing. It is simply the frustum of a cone with the center cut out, as shown, in order that the eccentric shaped jaws marked *B* may fit into the parts indicated. The jaws *B* rotate in this pocket, and not upon the pin or bolt seen. The pin or bolt with the spring around it is simply inserted for the purpose of making a foundation to fasten the spring to, in order to keep the jaws open when they are not in use. The jaws are held in place by two plates of steel marked *I*, these being somewhat smaller upon their circumference than the part marked *A*. The part marked *G* is a step to keep the spherical piece marked *A* in place, when not in use.

In using the tool, the shank is simply placed in any kind of a motor driven by air or steam and the opening pushed over the stay bolt, which has been entered in the boiler. As soon as the stay bolt reaches the jaws *B* (which it will be observed are made with a taper to take any size of stay bolt), they immediately rotate on their axis and the corrugated face, being firm on the curve which is not concentric with the rotating axis, grips the bolt, and the same force required to screw in the bolt causes the grip to become tighter on the end of the stay bolt through the eccentric action of the jaw. As soon as the bolt is screwed in and the motor stops, the chuck releases itself at once.

The frame marked *A*, holding the jaws, spring, etc., is so made that it will rotate in the frame marked *E*, so that in case the workman does not have his motor and the axis of the stay bolt in line, the chuck will revolve on the axis of the stay bolt, while the axis of the frame *E* may be inclined to that of the stay bolt any slight degree without interfering with the work.

A Siberian Railroad Ride.

A correspondent, writing from Omsk, one of the principal cities of Siberia, situated on the Irtysh River, near Soumy Lake, and about 1,900 miles due east of Moscow, thus relates his experiences on the journey from Moscow to Cheliabinsk, and from this place to Omsk, on the Trans-Siberian Railway :

The great Siberian Railway, properly speaking, begins at Cheliabinsk, nearly 1,400 miles beyond Moscow. This preliminary journey can be made in three days and four nights, on the whole not uncomfortably, at the exceedingly cheap rate of 37½ rubles, or some $20, for a first-class ticket. The fare all the way from St. Petersburg is proportionately even cheaper, as the Russian government a few months ago introduced the system of a rapidly decreasing rates of mileage for long distances. The trip is only moderately interesting. The country passed through is flat, and seems fertile and prosperous. The crowds at the stations are the usual picturesque, red-shirted muhiks, with a sprinkling of the original native inhabitants as one gets to the eastward. The Volga is crossed on an iron bridge 1,484 meters long a few hours before the train reaches Samara.

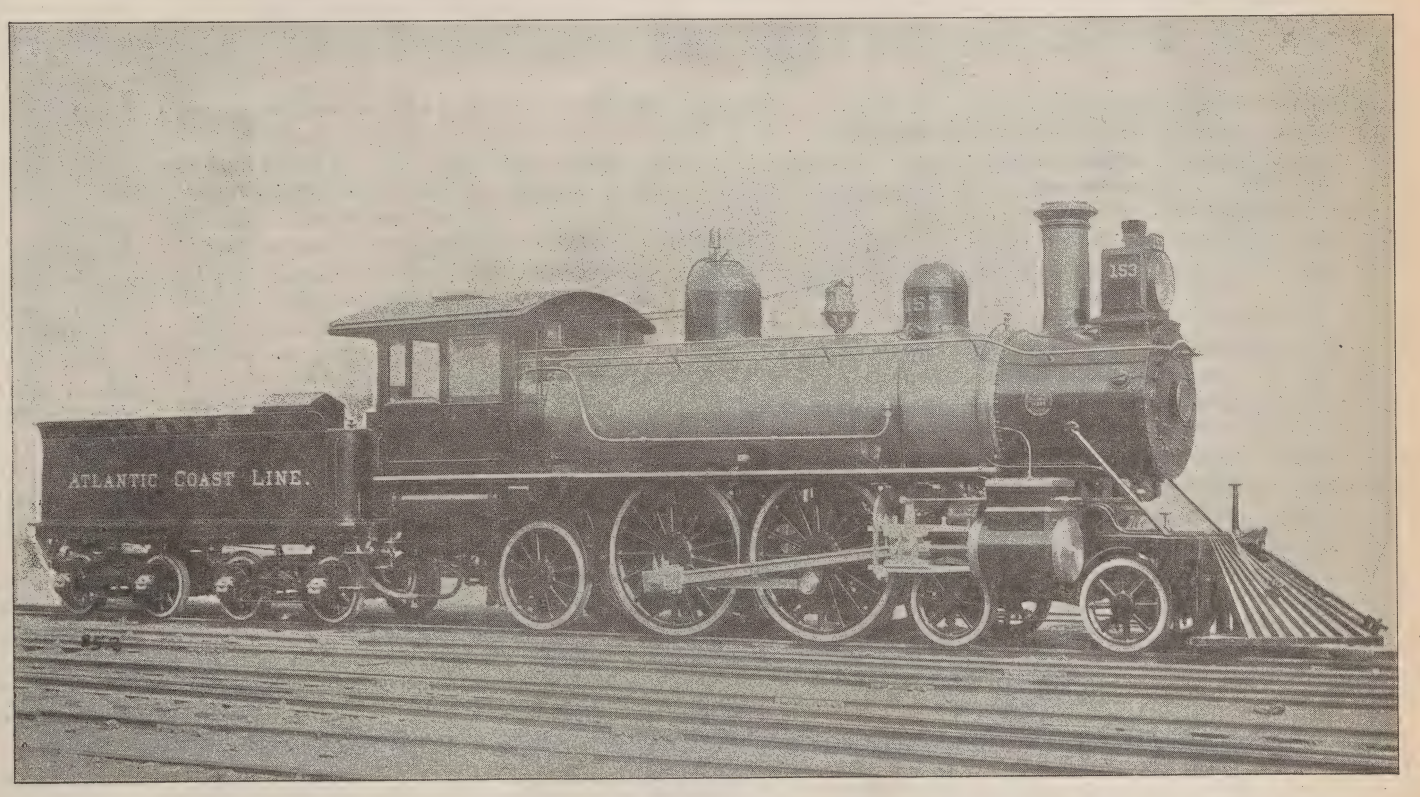
Cheliabinsk is beyond the Ural mountains, and already in Asia, but not in Siberia, as it lies in the government of Orenburg. The population, which is somewhere between 15,000 and 25,000, is rapidly increasing, thanks to the railway, and is likely to continue to do so, as from here a branch line is being built to the Perm-Tiumen road, which crosses the Urals further north. The station, in true Russian fashion, is a good mile and a half from the city, and about it a suburb is quickly growing up. The place itself is in some ways not unlike some of our own Western ones of the same size, with its unfinished buildings and general air of untidy newness, but there is less bustle, and the color is different; for, instead of our prevailing white, most of the houses are unpainted and weather-stained, giving a generally dark effect. Very different, too, is the population, with its soldiers and officials in uniform, its peasants (for the lower classes in the Russian towns still are peasants, long-bearded, red-shirted), its Tartars and Kirghiz, the latter of whom are apt to live in the surrounding country, from which they come into market. The streets are broad and shadeless, with the low houses, often of logs, straggling along loosely on either side, and carriages for hire abound, as the distances are considerable, and the Russians are not fond of walking.

The Trans-Siberian itself is at present finished and open from Cheliabinsk to Omsk, a distance of 741 versts, or about 500 miles. It takes nearly 48 hours to traverse this, not so much on acconnt of the easy slowness of the train as because at only one station does it stop for less than 20 minutes, while an hour or more is often consumed.

Our train was a fairly long one and packed, many of the upper-class passengers being on government service, among them half a dozen engineers who were going two or three thousand miles further to work on another section of the road. Besides several baggage cars, etc., there were three classes for travelers. There were no first-class cars, and the two second-class cars were borowed from elsewhere, and so old, bad and overcrowded that, like many of the other unfortunates with second-class tickets, I preferred to ride third. These third-class cars were the best I have ever seen, new-built expressly for this line, and capable at night of being turned into sleepers with three tiers of beds, thus insuring each of us a whole one, even if it was only a board. The five fourth-class cars were like freight cars, plus a few windows, and were provided with benches filled with men, women and children, a sturdy, cheerful crowd, not at all miserable in appearance, bound for the broad vacant lands of the East. Emigration to Siberia has increased very fast in the last few years.

Such of the stations as were finished were satisfactory brick buildings, with granite water towers near by, each with its embryo garden. At each the sight was the same. Knowing that the wait would be a long one, the passengers streamed out for air, exercise and refreshment. Three times a day we came to a buffet with very tolerable food, and more than ample leisure was allowed for a meal. Thus for two days and nights we jogged along, until, on the third morning, we saw before us, rolling northward, the great river Irtysh, partly spanned by a half finished railway bridge. By us were some wooden barracks for a temporary station, and in the distance, four or five miles off, the roofs and domes of the capital of this region, the city of Omsk.

The annual meeting of the Illinois Central Railroad was held in Chicago Oct. 16. The terms of Messrs. Stuyvesant Fish, Edward J. Harriman and John Jacob Astor expired, and they were re-elected directors. All the executive officers were re-elected. The proposition to increase the capital stock $10,000,000 did not come up, it having been made the subject of a special meeting.



BALDWIN SIMPLE PASSENGER LOCOMOTIVE FOR ATLANTIC COAST LINE, AT ATLANTA EXPOSITION.

Weight in working order, 129,800 pounds; on drivers, 73,000; on engine truck, 32,500; on trailing wheels, 24,300 pounds cylinders, 19 inches by 24 inches; steam ports, 16 inches by 1⅝ inches; exhaust ports, 16 inches by 3 inches; valve travel, 5½ nches; lead $\frac{3}{32}$ inch; outside lap, ⅞ inch; inside lap, ⅛ inch negative; area of each steam pipe, 19.63 square inches; driving wheels, diameter, 72 inches; journals, 8 inches by 10 inches; boiler, diameter, steel, 58¾ inches; 258 two-inch tubes, 14 feet 3 inches long; firebox, 42 inches wide and 89⅝ inches long; steam pressure, 180 pounds; radial stays; total heating surface, 247.2 square feet; grate, 26 square feet; smokestack, diameter, 18 inches; total wheel base, 49 feet 11½ inches; total length, 63 feet 8 inches.

Northern Pacific Annual Meeting.

The annual meeting of the Northern Pacific company was held in New York, Oct. 17. President Brayton Ives made the following statement at the meeting :

It is pleasant to be able to report a decided improvement in the condition of the company during the last year. The net earnings were greater by $1,384,204 than those of the previous year, and the increase to date of the present fiscal year is $876,448. Moreover, abundant crops and reviving business give grounds for believing that the improvement will continue. The present complications are unfortunate, but there is reason to believe that they will be of short duration, and in any case they can hardly be as costly to the road as the management of the old receivers.

The stockholders are to be congratulated on the failure of a plan formulated by the Adams Committee, which, under guise of reorganization, was intended to secure the absorption of the Northern Pacific by the Great Northern, and its elimination as an independent corporation. Fortunately, the plan was open to so many objections of a financial, legal and moral nature that it barely survived its birth. It is rumored that the same parties are striving to reach the same end by different means, but there is little prospect of success. The Northern Pacific has seen its darkest days. The region thr ugh which it runs is growing, and must grow as rapidly as any in the country. For years the road has been weighed down by incompetent or dishonest management. If it can be run on a strictly business basis it cannot fail to give good returns to its security holders and satisfactory service to the States which it traverses.

Mr. Ives said he had known the road for ten years, but had never before seen it better prepared to handle the business which he foresaw was coming to it.

A Vestibuled Locomotive Tender.

The requirements of the Railway Mail Service have resulted in numerous improvements in mail cars calculated to enhance the safety of the mail clerks and facilitate their work. Among the most noticeable of these is the addition of vestibules extending over the platforms, on cars where platforms are still retained. The St. Louis Southwestern road has gone a step further and added vestibules to the rear of the tenders of two of its passenger engines used in fast mail service between Pine Bluff and Texarkana, and our illustration reproduces a photograph of one of these engines coupled to its train. The arrangement was designed by Mr. R. M. Galbraith, General Master Mechanic of the St. Louis Southwestern, to whom we are indebted for our illustration and information. We hope to be able later on to reproduce drawings showing the details of this construction, but at present these are not available. Of course our readers will understand that the objects in thus equipping the tender with a vestibule are simply to attain greater rigidity of connection between the locomotive and the train, thus diminishing jerks and oscillation, and the chances of telescoping in case of collision.

Vestibuled Tender, St. Louis Southwestern Railway.

Eighteen persons were killed and nearly a hundred injured in a collision between a freight and a passenger train near Brussels, Belgium, Oct. 7.

The Board of Trade of Brazil, Ind., has offered the Chicago & Southwestern Railway a subsidy of $20,000 if the shops of the company are erected there.

A dense fog brought about a rear collison on the Pittsburgh & Lake Erie at Beaver Falls, Pa., Oct. 10. A locomotive and 15 freight cars were wrecked.

Traffic on the Western roads is increasing at a very rapid rate. Traffic officials of the Burlington, for instance, say that the earnings of their lines are $10,000 a day greater than at this time last year. The increase is not due to any crop movement, but to the stimulus of general business which the large crops of the West have caused.

Union Pacific Reorganization Plan.

The reorganization plan for the Union Pacific Railway Company was issued October 17 by the Reorganization Committee, which consists of General Louis Fitzgerald, Jacob H. Schiff, T. Jefferson Coolidge, Jr., Chauncey M. Depew, Marvin Hughitt and Oliver Ames, with the cooperation of Kuhn, Loeb & Co., bankers for the committee and managers of the reorganization syndicate. The circular calls attention to the need of united action of the security holders. The statement shows that the main lines affected by the reorganization include the Union Division, Council Bluffs to Ogden ; Kansas Division, Kansas City to Denver ; the Leavenworth Branch, Leavenworth to Lawrence, and the Cheyenne Division, Denver to Cheyenne; a total mileage of 1,827.59 miles.

The balances due to outstanding land and town lot contracts on Dec. 31, 1894, on Union, Kansas and Denver Pacific Divisions, were $6,162,751.55, and the unsold land grant lands (excluding those under contract) amounted on that date to 6,524,000 acres, of an estimated value of $13,358,500. The bonded indebtedness of the company on Oct. 1, 1895 (including collateral trust obligations amounting to $20,092,000 and not embraced in the plan), amounts to $87,386,350. The debt to the Government was : For principal, $33,539,512 ; for interest (approximately after deducting estimated value of the sinking fund), $19,500,000 ; total funded debt, $140,425,862. The outstanding capital stock of the present company is $60,808,500. The reorganization plan contemplates the issue by a new company of :

First mortgage railway and land grant fifty-year 4 per cent. gold bonds	$100,000,000
Four per cent. preferred bonds	75,000,000
Common stock	61,000,000

The new bonds are to be secured by a first and only lien upon the main line mileage of the entire equipment, land grant, lands and land contract balances, and upon such branch lines of railway as the committee shall avail of through the ownership in mortgage trusts of branch line bonds. The preferred stock is to be entitled to 4 per cent. non-cumulative dividends, payable out of net or surplus earnings before the payment of any dividend on the common stock.

The average annual net earnings for the period 1885-1894 inclusive were $7,563,669.10, greater by $563,669.10 than the maximum interest and dividend requirements upon the new bonds and preferred stock provided for in the plan. The lowest net earnings were in 1894, being $4,315,077.25, or $315,077.25 in excess of interest on the maximum amount of proposed bonds of the new company.

Railroad Organization.

President H. S. Haines, of the American Railway Association, addressed the convention on the above subject at its meeting in New York, Oct. 16. He said that there are three departments of a railroad, the roadway, the machinery and the transportation departments. To be efficient each should be under a single head, and all should be under one managing officer, himself responsible to the corporation. For the proper conduct of the operations of a railroad as a means of transportation, the manager, with his subordinates, should be responsible to the corporation ; and for the making of tariffs, the solicitation of business and the collection of revenue, the traffic manager should be responsible.

The organization of the roadway department should consist of an engineer of maintenance of way with one or more assistant engineers reporting directly to him, as also one or more roadmasters responsible for the section gangs in charge of track and the forces necessary for the maintenance of buildings, bridges, fuel and water stations and permanent signal apparatus. To the roadway department should be assigned the care of shop buildings and engine houses as well as of any other structures. Continuing he said :

We next come to the department in charge of the construction and maintenance of locomotives and cars—briefly termed the machinery department—and which is readily divisible into the locomotive department and the car department. On some roads each of these departments may be in charge of a foreman. On others the shops may be so extensive as to justify a more radical separation of the two under a master machinist for the one and a master car builder for the other, but the whole department should be under the control of a competent mechanical engineer to be styled the mechanical superintendent.

This department should not control the employment of enginemen, firemen, wipers or car cleaners, for this class of men belongs to train service and not to maintenance. This is also true of the storage and issuing for fuel for locomotives, which is not necessarily connected with shop work and is more or less distributed along the road.

Where there are several division shops, the principal repairs or reconstruction of rolling stock should be concentrated at one of them, for special tools can thus be more profitably employed, and also a better class of draughtsmen and mechanical engineers than if such work were scattered among all the shops on the road.

Designs, plans, specifications and contracts for new work should be prepared in the office of the mechanical superintendent, and if locomotives or cars are built by the company to any considerable extent, the shops for this work should also be directly under his supervision.

The organization of the machinery department would then comprise a mechanical superintendent, assisted by a master machinest in charge of the locomotive department and a master car builder in charge of the car department, with foremen in charge of the several division shops and a competent mechanical engineer in charge of the principal shop in which all the new work and reconstruction is carried on. There will also be required the services of a general storekeeper.

Next in order is the transportation department, to which is assigned the work for which the track and the rolling stock have been built and are maintained. The manner in which its operations are conducted is the test as to whether persons and things are transported over the railroad with safety and despatch, and upon the manner of its organization is largely dependent the success of the corporation. The head of this department should control all the instrumentalities essential to transportation from the time that a person or thing comes under the care of the corporation until they pass out of it. Such a control would cover all responsibility in that connection not assigned to the roadway and machinery departments, and would exclude the making of tariffs, the solicitation of business, the collection of revenue, and the purchasing of materials and supplies.

Meeting of Superintendents.

The annual meeting of the American Society of Railroad Superintendents was held in New York, Oct. 14, with President Beach in the chair. Twenty new members were elected, making the active membership 216. The advisability of holding the meetings earlier than October was discussed, also the necessity of printing committee reports in time to be sent to members before the convention. The report of the committee on machinery stated that loading trains on a tonnage basis is a great improvement on present general practice, the train mileage on a division of the Pennsylvania Railroad having been reduced one-seventh by this means, and it having effected a saving of two cars per train on the Union Pacific. The report recommended the payment of premiums to engine men for saving coal, oil and waste. It stated that on a division of the Pennsylvania Railroad nearly $2,000 was paid in July to the men for premiums.

Discipline without suspension received some discussion. Some members did not believe in sparing the rod, others placed greater faith in the efficacy of the golden rule. One member said that discharge should be only in consequence of the verdict of two or three men, as a discharge often practically blacklisted a man. Mr. C. A. Wilson, of the Wheeling & Lake Erie, abandoned suspensions a year ago, and on his road has serious discipline administered by a board that meets once a month. He has found the milder way quite effective in dealing with even the rougher elements. Some one asked General Superintendent Whittelsey, of the Ohio Central,if he had actually made no suspensions whatever during the past year, and he replied that he had—he had suspended collisions entirely. This plan is now in use on the Wheeling & Lake Erie, Toledo & Ohio Central, Toledo, St. Louis & Kansas City, Pittsburgh Cincinnati, Chicago & St. Louis (one division); Chicago & North Western (one division); Louisville and Nashville (one division), and on the Chicago & Alton.

The time and place of holding the next meeting will be announced later. The new officers elected were: President, C. B. Price, of the Allegheny Valley; First Vice-President. W. F. Potter, of the Flint & Pere Marquette; Second Vice, President, Seely Dunn of the Louisville & Nashville.

This year's potato crop in the United States is estimated to be the largest ever known.

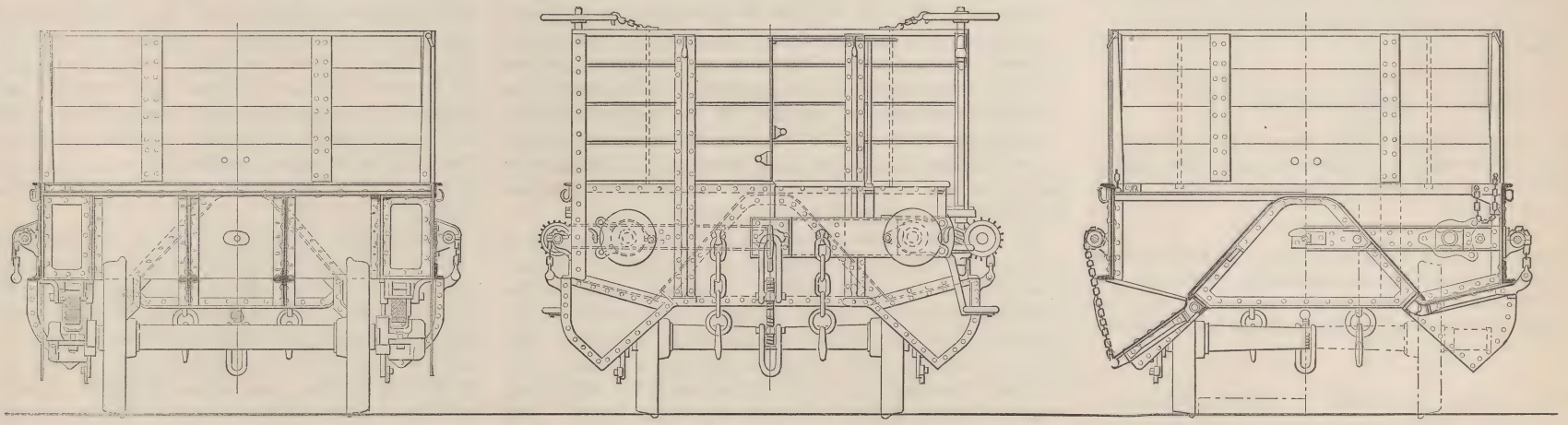
It is said that all the messengers in the employ of the American Express Company have received an outfit of Winchesters and rovolvers to resist train robbers. The company also advises its men to become proficient in rifle and revolver practice, and hints that in the near future prizes will be awarded to the most proficient marksmen.

A French Side-Hopper Ballast Dumping Car.

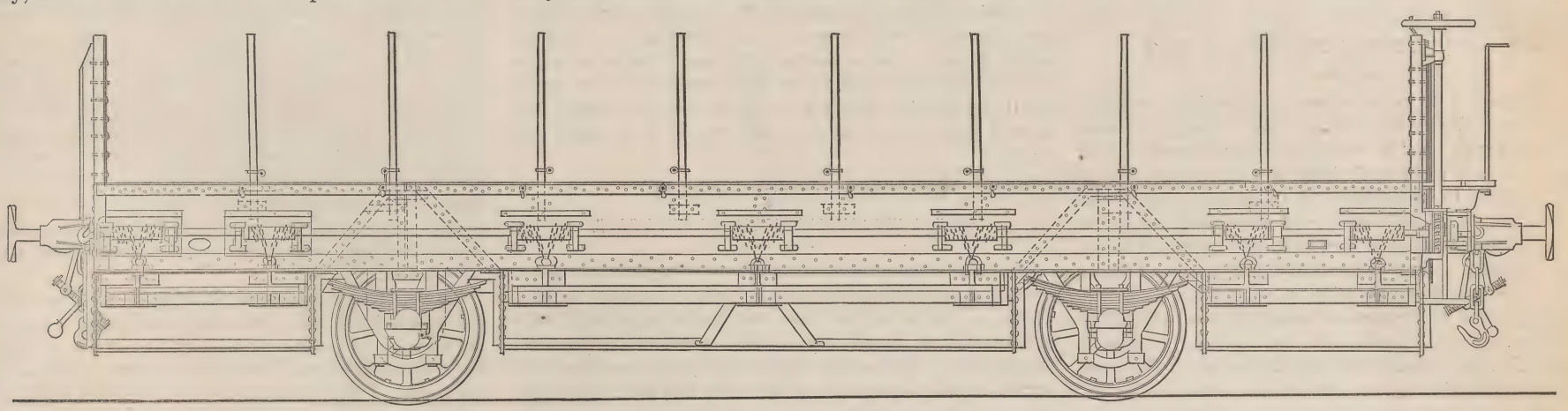
The automatic ballast dumping car, illustrated by the engravings on this page, was designed by M. Meraux, and a number of the type are used on the lines of the Company de l'Est Francais. The car is made entirely of metal, the box or body being composed of sheets of ¼ inch iron strongly rivited together and well braced beneath the bottom by lateral braces between the sides of the hoppers. These hoppers extend the full length of the car on either side, and are equipped with three trap-doors each at the bottom that are raised and lowered respectively by the winding and unwinding of chains on a shaft actuated by gearing connected with an upright rod and hand wheel (similar to a brake wheel and shaft) at either corner of one end. The arrangement of these trap-doors and their method of operation is so plainly shown by our engravings that further description is unnecessary.

The openings formed by the falling of these trap-doors are 19 inches (nearly) by 10 feet 9 inches for the middle ones, and 5 feet 5 inches for the end ones. These cars with this arrangement of trap doors have proved very satisfactory. Each has capacity for 15 tons of stone or gravel ballast, and one man generally unloads a car completely, and closes the trap-door in two minutes. The man in charge of the unloading stands on a platform at one end of the car, from which he can act successively on the two hand wheels, each acting by means of a vertical screw and spiral gearing on the horizontal shaft carrying the chains that operate the trap-doors.

This type of car was designed in detail in the office of the company, and a number built in the shops at Mohon. The car is 26 feet long inside, and 29 feet 11 inches long over the buffers. It is 8 feet 5½ inches wide and 7 feet 11 inches high, and is designed for a gage of 4 feet 10½ inches.



Cross Sectional and End Views of French Side-Hopper Car.



Side Elevation of Frenoh Ballast Car With Side-Hoppers Open.

New Terminal in New York for the B. & O. Railroad.

It is stated that the Baltimoro & Ohio Railroad is to establish its main New York terminal at St. George, Staten Island, and that the Rapid Transit Company will begin operating trains from the new terminal next April. The company has already spent $137,000 in and about St. George on the bulkheads and substructure, and $150,000 more is to be spent on the terminal building. This building is to be two stories high, and to be principally of iron. It is to be a combination of a passenger terminal station and a ferry-house. A waiting-room 50 by 75 feet will take up a large part of the first floor. The second will be used for offices. There will be the usual train shed and all the other appurtenances of a first-class railroad terminal and ferry-house. The size of the building proposed indicates the intention of the Baltimore & Ohio to make this its main New York terminal, not only for freight, but ultimately for passengers as well.

A new naphtha spring was discovered in Russia in September. This spring threw out 500,000 poods daily at the outset; between September 13 and September 20, 1,000,000 poods a day, and for each of four consecutive days subsequently, 1,500,000 poods, the fluid jetting to a great height. A pood is equal to 36 pounds avoirdupois.

An Improved Caboose.

A Pittsburgh paper says that a new caboose car constructed on lines suggested by conductors and brakemen is being tried on the Pittsburgh division of the Panhandle road. The car has eight wheels, and the cupola is 15 inches higher than the old pattern, the top of the roof being 15 feet from the top of the rail. There is no ladder on the outside of the car, access to the roof being had through doors 21 inches by 39 inches in the ends of the cupola. The trucks are arranged for 36-inch wheels, this being the size of the standard wheels used under passenger cars, which, when partly worn, are transferred to cabooses. The new car has eight longitudinal sills, two more than have heretofore been used. The platforms are 31½ inches long, being 10 inches longer than the old standard. A safety bar is provided in the gangway at the center of the handrail. The frame of the car has been made stronger, the posts and braces being 1½ inches by 3½ inches, while in the old car they were 1½ inches by 2½ inches. The cupola being higher, it is braced with iron braces running down the side plates. There are two stationary outside seats upon each end of the cupola provided with safety bars and hand rails.

A Novel Church.

When the cable and trolley cars replaced the horse cars in Baltimore, the plan of selling old cars at low prices was adopted, and the cars were put to a variety of uses. They have been made the cabins of houseboats, perambulating dairy lunch rooms, cow stables and chicken coops, but it remained for a congregation of colored Baptist brethren to get two old cars and turn them into a church.

They had been worshiping in a shoe shop, but the accommodations were insufficient, and for some time the little band was trying to get other quarters. They did not have enough money to build a church, even of the plainest kind. They knew old street cars were a drug on the market and could be bought for a song, so a committee went to see the officers of the City & Suburban Railway Company to learn what sort of a deal could be made for a car or two. The committee succeeded beyond its expectations, for the company made the congregation a present of two of the old eight-wheeled cars which were used on the Lake Roland Elevated Railway.

The cars were moved to Stony Run, nearly opposite the shoe shop, whose owner is something of a carpenter and general mechanic as well as a shoemaker, and who has undertaken to fit them up. At present they are propped up on trestles and soap boxes, and the interiors have been partly taken out. One side of each car will be removed, and then the two cars will be put together so as to make one good-sized room. The roofs will be joined and additional seats will be put in, together with a pulpit in one end, and the church will be ready for occupancy. No baptistry will be built in the church, as Stony Run, which is immediately in the rear of the building, answers that purpose.

The New York, New Haven & Hartford Railroad has assumed control of the New England Railroad. The papers have been transferred, and a majority of New England stock is held by the "Consolidated."

Railroading in China.

An interesting report upon Chinese railroads has just been furnished to the State Department by United States Consul Read at Tien Tsin. He tells of the difficulties that were encountered by the young English engineer who ran the first locomotive, in overcoming the superstitious repugnance of the natives and the government to the "Rocket Dragon," as his home-made locomotive was called, and of the engineering features of the road from Tien Tsin to Shan-Hai-Kwan, and gives the following incident of the first trip by steam of the old Viceroy, Li Hung Chang:

As Director-General of the road he was given a special car. This was furnished with elaborate chairs, lounges, tables, etc., upholstered in silk and satin. Li on his first trip was profuse in his expressions of admiration. Upon his return to Tien Tsin his satisfaction had reached such a point that he ordered all the furniture, hangings, etc., to be removed to his Yamen (palace). To the disappointment of the great Viceroy, the special feature of the car—the luxurious bed—was left behind, as it had been built into the car. The directors learned a lesson, and the Viceroy's new private car has furniture that cannot be removed.

Power From Town Refuse.

An article on this subject is contributed to *Cassier's Magazine* for November by Mr. B. H. Thwaite, in which it is said that, for municipal purposes, use may be made of the organic and other combustible refuse of towns for generating power, but to a very contracted extent. The heating value of the refuse fuel has been very much over valued.

When it is known that the vegetable organic matter that enters so largely into town refuse contains from 50 to 80 per cent. of moisture, it requires no lengthy explanation to show that before any heat energy is available for useful external work a considerable proportion, if not all, of the heat available in the burning of the solid portion of the organic matter is absorbed in the internal work of evaporating the large proportion of the moisture present in the refuse itself. It is difficult to estimate the caloric or heating value of this refuse fuel, as every town will have its own characteristic kind of refuse. With good average refuse, an evaporative value not exceeding one-fifth of that of ordinary common coal might be taken.

The low-heating value necessarily involves a large expenditure in steam generation plant to obtain equivalent power output. But even allowing for this fact, involving high prime cost of steam boiler plant, it is conceivable under certain circumstances, that for limited municipal purposes, this refuse fuel may be economically employed; but it can never, except to a very insignificant extent, come into commercial competition with the use of coal.

At the meeting of the American Public Health Association in Denver, Oct. 1, the first paper, "The Mississippi River as a Sewer," was read by Dr. Josiah Hartzell, of the Ohio State Board of Health. After giving figures to show the extent of the drainage basin of the river, he gave some startling statistics on its pollution. Four cities annually contribute 265,000 tons of garbage and 4,000 carcasses of diseased animals to the stream.

NATIONAL CAR AND LOCOMOTIVE BUILDER

ESTABLISHED IN 1870.

PUBLISHED MONTHLY

BY

R. M. VAN ARSDALE,

MORSE BUILDING.....NEW YORK.

GEORGE H. BAKER, Editor.

HERBERT W. POOL, Business Manager.

NOVEMBER, 1895.

Subscription.—*$2.00 a year for the United States and Canada; $2.50 a year to Foreign Countries embraced in the Universal Postal Union.*

EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING PAGES. *The reading pages will contain only such matter as we consider of interest to our readers.*

Special Notice.—*As the* NATIONAL CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, correspondence, advertisements, etc., intended for insertion must be received not later than the 25th day of each month.*

Contributions.—*Articles relating to railway rolling stock construction and management and kindred topics, by those who are practically acquainted with these subjects, are specially desired. Also early notices of official changes, and additions of new equipment for the road or the shop, by purchase or construction.*

To Subscribers.—*The* NATIONAL CAR AND LOCOMOTIVE BUILDER *is mailed regularly to every subscriber each month. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery, and in case the paper is not then obtained this office should be notified, so that the missing paper may be supplied.* **When a subscriber changes his address** *he ought to notify this office at once, so that the paper may be sent to the proper destination.*

SAFETY REQUIREMENTS FOR FREIGHT CARS.

As only about three months remain in which to comply with the Act of Congress requiring that freight cars used in interstate traffic be "provided with secure grabirons or handholds on the ends and sides of each car for greater security to men in coupling and uncoupling cars," and that the drawbars of such cars be of a standard height of 34½ inches, the equipping of cars with the necessary handholds and raising them to secure the proper height of drawbars is the work that is now being most actively pushed in the car shops and repair yards of nearly all the railroads in this country. The postponed date for the taking effect of the law is Feb. 15. There will probably be no further general postponement in the matter, and unless the law is complied with by the date set railroad companies neglecting its requirements may expect to be fined $100 "for each and every violation," and perhaps suffer some interruption of traffic due to refusal of their cars in interchange.

The Executive Committee of the Master Car Builders' Association has recommended arrangements of steps and handholds calculated to more fully meet the requirements of the law and the safety of men engaged in switching cars than the "recommended practice" of the association in regard to this matter does. In our September issue we published diagrams showing the recommended locations of such steps and handholds, and in our October issue we published figures showing that of 973 votes cast on the matter in informal ballot 653 votes, or more than two-thirds, favored the committee's recommendation. This strongly indicates that the same will be adopted by the convention next June. A number of objecting voters disapproved of placing handholds in the center of the end of box and stock cars, as recommended, and some objected to placing handholds underneath end sills of flat and gondola cars. The handholds in the center of the ends of box cars as recommended by the committee are very necessary for the safety of men in uncoupling cars when running switches are made, and frequently when cars are being "kicked" in switching. Running switches are generally forbidden, but they are frequently necessary and are generally as frequently made. The only fact that master car builders need to concern themselves about is that in the practical switching of cars these handholds are necessary. They should have been placed in the position indicated many years ago, and had they been many a bright young life that was cruelly snuffed out would have continued to a probably better condition and a happier end. Switching cars is the most hazardous work in the operation of a railroad and each year it claims a greater number of victims than any other branch of the service; therefore, whatever can be done to reduce its hazard is both wise and humane.

The recommendation of the committee to place handholds beneath the end sills of flat and gondola cars is also wise and proper, although 85 votes were cast against it. Their location on the outside of the sill instead of beneath it is dangerous to trainmen in case a drawbar should brake or be pushed in while coupling. In that emergency a man between the cars needs all the room—every chance for his his life—possible, and handholds placed beneath the sill instead of on the outside might in many cases easily make the difference between a longer life and a funeral.

Two important points should be kept in mind in the equipment of cars to comply with the law. First, security instead of rapidity in applying the handholds, as there is danger of too much attention being given to doing the work rapidly instead of well; above all, the handholds should be secured beyond the possibility of pulling off in service, and to this end it should be seen that bolts are securely fastened, and that when lag screws are used the holes to receive them are bored to give the maximum holding strength. Second, that, while the work is pursued with reasonable celerity, the general maintenance of the cars in service is not neglected. Foremen and workmen are apt to take narrow views of such matters, and to give almost undivided attention to carrying out instructions that are made special by the head of the department, and it requires some watching in order to have matters of importance to the proper and safe movement of trains given due attention while the new work is being pressed.

The standard height of couplers named by the American Railway Association, in compliance with the Act of Congress referred to, is 34½ inches, "measured perpendicular from the level of the tops of the rails to the center of the drawbars," and the maximum permitted variation from this is 3 inches. The understanding of the Master Car Builders' Association is that 34½ inches is the maximum height and that 31½ inches is the minimum height. The practical standard that it is safe to aim at is about 33 inches; according to the law and to general understanding this will permit a variation of 1½ inches either way. The law does not fix a maximum and minimum height. It requires a standard and permits a variation within three inches; 34½ inches was named for the standard, and the understanding was immediately adopted that this should be considered the maximum height, and this implied that the minimum height must be 31½ inches. The law itself is not clear and definite, but general practice is. According to the law variations of 1½ inches on each side of 34½ inches may be allowed. This would permit a coupler 36 inches high; and yet another coupler 31½ inches high would be within the legal limitations. The law is at fault because not sufficiently explicit, and it will doubtless be corrected in this respect; but general practice and the understanding adopted by the master car builders practically settles the limits as being between 31½ inches and 34½ inches, and beyond doubt if the law is revised it will be to make this explicit.

COLLISIONS ON DOUBLE TRACK RAILROADS.

We have before referred to the almost frequent disastrous wrecks on some double track railroads by an accident happening to one train that suddenly and unexpectedly piles cars directly in front of a rapidly approaching opposite-bound train. There have been a full half dozen fatal and expensive wrecks caused in this way this year, and it becomes our melancholy duty to announce the occurrence, on Oct. 24, of the latest such wreck on one of our best managed railroads. It seems a pity that when railroads began to lay double tracks for opposite-bound traffic that a space of about 15 or 20 feet could not have been interposed between the tracks. Then a derailed train on one track probably would not interfere with the safety of trains on the opposite track. As it is, there is but a few feet of space usually between such tracks, and a derailment on one generally involves a blockade of the other, always threatening, and only too frequently causing fatal and disastrous wrecks. Naturally this illustrates the great importance of preventing the initial failure or accident by proper maintenance of road and rolling-stock and careful movement of trains. Evidently on ordinary double track roads this is about all that can be done now to prevent these kind of wrecks; but on roads that have more than two parallel tracks another effective step beyond this can be taken. Where there are two tracks for fast and slow traffic, respectively, bound in the same direction, these should be adjacent, and not, as is sometimes the case, separated by a track or tracks devoted to opposite bound traffic. In the latter case trains running 50 miles an hour frequently meet and pass with only a very few feet of clearance trains running equally fast in the opposite direction. The sum of their velocities indicates the frightfulness of possible collision, the conditions for which may exist in an insecure brakebeam or defective wheel, or, as in the latest case, a defective axle. While such defects would naturally be as potent for the derailment of a train running in the same direction as of a faster opposite bound train, the probable consequences would not be so disastrous. If the accident happened when the trains were about to pass there would be more time and a greater distance in which to avert collision or mitigate its severity.

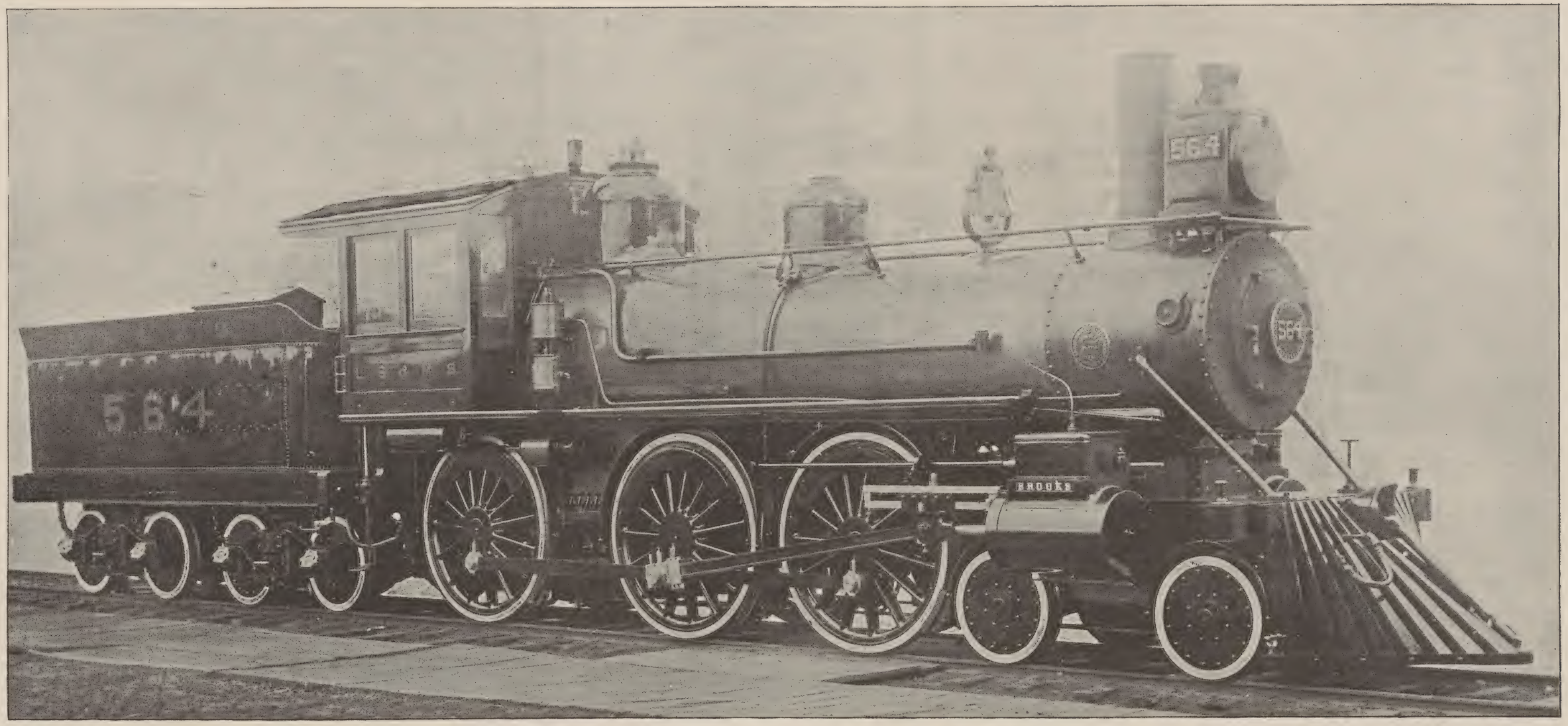
LARGER FREIGHT CARS.

The Master Car Builders' Association has appointed a committee to propose standards and present detail drawings to the next convention in reference to trucks for 40-ton capacity freight cars. One road is reported as having recently ordered nearly 400 cars of that capacity, and several other roads are reported as contemplating the addition of numbers of such cars to their equipment; and in our last September issue we reproduced the general and some detail drawing of a 70,000 pounds capacity car. If the proverbial straws do ever show the way the wind is blowing they indicate a very decided movement toward larger and stronger freight cars than we have yet known. Considerable attention is likely to be bestowed on the construction of trucks to carry the heavier burden that will be imposed by such cars, as indicated in our opening remarks, but it is possible that other at least equally important details of construction may not receive due attention. Very little has been said yet about strengthening the framing of the intended larger cars to meet the resulting requirements of heavier loads. In a short discussion of this topic at the last meeting of the New York Railroad Club Mr. George L. Fowler struck the key-note of the situation by referring to the fact that not sufficient attention is generally given to the proper trussing of cars and that there is wide divergence in practice, and that in contemplating the adoption of larger freight cars or increasing the loads of cars as at present constructed this matter becomes of importance.

Mechanically speaking, there is practically no upper limit in the possible capacity in car construction, either in cubic contents or in weight to be carried. The limitations of cubic capacity are those arising from the breadth and height of tunnels and bridges, and the necessary clearance at the sides of the track that limits the length of the car on passing curves. One of the difficulties, however, under which carbuilders labor is the fact that in the proportioning and strengthening of the framing and running gear no one knows the stresses to which the parts may be subjected. It will probably be agreed, however, that a freight car should be so constructed and the truss rods so proportioned that they are capable of sustaining the whole load of the car, as it would naturally fall upon the cross-tie timbers were the sills to be considered as made up of three lengths extending from the body-bolsters to the cross-tie timbers, and between these two latter. On the ordinary 34-foot car, as commonly built, it may be considered that about two-thirds of the load lies between the body bolsters, and of this two-thirds about three-eighths would be carried normally by the body bolsters direct, leaving, on a car of 60,000 pounds capacity, about 25,000 pounds to be carried by the truss rods. These figures are of course not fixed, as they will vary with every change in the distance between truck or body bolster centers, as well as with the distance between cross-tie timbers. And in this connection it may be remarked that probably the best distribution of strains on the framing will be obtained if the cross-tie timbers are so spaced that half the distance between them plus the overhang shall equal the distance from a body bolster to the nearest cross-tie timber, a condition that is nearly attained on a 34-foot car with the cross-tie timbers from 6 feet to 7 feet apart.

Taking the bottom of the flooring of a car to be 4 feet 2 inches above the rails, the usual method of trussing is to use four 1⅛-inch rods with about 2 feet drop. If these rods are of iron, the normal static stress under a full load should not exceed 7,000 pounds per square inch of cross-section, and this with the general dimensions just outlined would make the four of them capable of sustaining a load of about 12,000 pounds, or less than one-half that imposed upon them. The result is that, if the rods are to meet the requirements outlined, we must increase the depth of the trussing, increase the number of rods or raise the strains per square inch of section. Increasing the depth seems the more rational method, and there is no good reason why the kingposts should not reach within a foot of the rail. This would give the four rods a sustaining capacity of 17,500 pounds, and by using six rods we will have a sustaining power of 26,250 pounds.

This provides for the supporting of the load at rest, and we have in addition to take care of the running stresses. Does anyone know what these are? The rule-of-thumb has been applied with a vigor to this branch of mechanical engineering in a way to make the members of the profession blush. Bolsters have proven themselves too weak for their burdens, and they have been strengthened by guess work only to be again found wanting. They bend under the running stresses until the weight carried by the side-bearings approximates that on the center-plate, and we fully deserve the criticism of the Belgian engineer who said: "Theoretically the Americans believe in maintaining a clearance between their side-bearings and of carrying the whole load upon the center-plates; but, practically, they have found it to be impossible to realize their ideal theoretical conditions, for their bolsters cannot be made of sufficient strength, and so yield under their loads until in actual working conditions, their cars exactly correspond with those on the continent of Europe, where a large proportion of the weight is originally put upon the side-bearings." No one realizes more than car-builders this true state of affairs, and this one thing if nothing else will tend to limit the capacities of our cars.



A RECORD BREAKER.

TEN-WHEEL FAST PASSENGER ENGINE—LAKE SHORE & MICHIGAN SOUTHERN RAILWAY.

GEORGE W. STEVENS, Superintendent of Motive Power. BUILT BY THE BROOKS LOCOMOTIVE WORKS.

On October 24, 1895, this engine broke the world's record for long-distance fast running, making 86 miles in 71 minutes—72.72 miles per hour.

On the day named the Lake Shore & Michigan Southern Railway ran a special train of three drawing-room cars (weighing 375,000 pounds) from 100th street, Chicago, to Buffalo Creek, Buffalo (the outskirts of both cities), 510 miles in 8 hours and 1 minute, 63.60 miles per hour including stops, or 64.98 miles per hour excluding stops; 10 minutes and 57 seconds being lost during five stops to change engines. The first 424 miles were run by four 8-wheel engines, with cylinders 17 inches by 24 inches, at an average speed of 63.22 miles per hour. The last 86 miles were run by engine No. 564 at an average speed of 72.72 miles per hour. The train drawn by this locomotive left Erie at 10:20 A. M., passed Dunkirk 10:59, reached Buffalo Creek 11:30, making an average speed from Erie to Dunkirk (47.7 miles) of 74 miles per hour, an average speed from Erie to Buffalo Creek (86 miles) of 72.72 miles per hour, and a maximum speed at two different points (maintaining the same four miles in each instance) of 96 miles per hour. The fastest long-distance run previous to this was made by the 999 on the New York Central & Hudson River Railroad in May, 1893, running 80 miles between Rochester and Syracuse at the rate of 68.45 miles per hour.

GENERAL DIMENSIONS.—Weight in working order, 113,500 pounds. Cylinders, 17 inches by 24 inches. Driving wheels, 68 inches in diameter. Crown bar, wagon top boiler, 52 inches in diameter, carrying 180 pounds of steam pressure and containing 202 two-inch flues, 13 feet 10 inches long, and having 1,603 square feet of heating surface, and 28 square feet of grate surface. The valves have 1 inch outside lap, 3-32 inch inside lap, and 1-64 inch lead in full gear. Maximum valve travel, 6⅛ inches. The engine burned bituminous coal.

But the objection to this may be that our cars are running under loads of 60,000 pounds and with only four truss rods of 1⅛ inches diameter. Where strength is lost in the rods it is carefully provided for in the framing and especially in the side boards. These latter are no longer the loose boards resting against the stakes, but have become an integral part of the car, and recent specifications very carefully provide that the side boards shall be accurately fitted and held to the sills by strap bolts in addition to being keyed together so that they form a girder varying in depth from 2 feet to more than 4 feet, running the entire length of the car. For cars of the gondola type this will answer very well, but for box cars where the upper framing is broken by the door we are dependent upon the sills, and as these must be stiff enough to withstand the buffing stresses of the train they can naturally carry some of the load. But it does not seem that they should be called upon to withstand the excessive strains to which they will be subjected if the cars are lengthened or the capacity increased. When we see bolsters that are perfectly capable of carrying a static load of 50,000 pounds and have a margin of two and a half for a factor of safety, and then see such bolsters yielding under a load of 30,000 pounds, taking a permanent set and bringing the side bearings together, it is about time to consider whether or no we have not nearly reached the limits of our ultimate capacity.

If, however, the traffic departments require cars of increased capacity over those now in use, it would seem that the only resource will be in the construction of an iron car. Of the limitations of this type of construction we are not prepared to speak, for it seems that they reach so far beyond the present demands as to offer a practical solution of the problem; but with the present type of box-car construction, using pine sills and oak upper framing, it seems that the dimensions and capacities of cars should not be increased to any great extent beyond their present limits.

The question of large cars, considered purely from a point of size and intended for carrying comparatively light loads of bulky freight, is one that concerns the traffic department more than it does the mechanical. If a car-load is fixed at 24,000 pounds, and the traffic manager of a road, in his competition with a rival line, finds it to his advantage to offer cars of such a cubic capacity that 24,000 pounds of willow ware can be carried, his car builder will probably be able to meet his demands and not exceed the limits of stresses that we have indicated as being advisable to remain within. But if the question arises of retaining this same cubic capacity and excessive length, and then loading at the rate of 2,000 pounds per running foot, it becomes a matter of great importance, involving not only the wearing qualities of the rolling stock, but the safety of trains.

At the last meeting of the Western Railway Club, Mr. J. Snowden Bell read a valuable and exceedingly interesting paper historically treating "Wide Firebox Locomotive Boilers." We commend the article to the careful perusal of locomotive men. It begins with a description and illustration of the first firebox on top of the frames, and made as wide as the distance over them between the wheels would allow (1857), and concludes with the descriptions of the latest locomotives utilizing this arrangement.

As we predicted some months ago, there is now a scarcity of freight cars to handle the increased and still rapidly increasing freight traffic of the railroads all over the country, but particularly of those in the West; and consequently there is a rush for building new cars. The Pennsylvania Railroad has placed a hurry order for 1,000 new cars, the Grand Trunk has done likewise, as has also the New York, Lake Erie & Western, and the New York, New Haven & Hartford has ordered over 2,000; and orders from a dozen other roads announced in this issue aggregate 3,500 more cars, with specifications issued for 7,000 more. Here are orders actually placed within the last month and prospective within the coming month of over 15,000 new freight cars approximating in value $7,500,000. The value of new locomotives ordered in October approximates $550,000, and the order for Russian locomotives will bring about $400,000 of Russian gold to this country. The prospective business mentioned is a practical certainty. The eight and half a million dollars thus virtually placed in the building of new railroad rolling stock must stimulate countless industries, and while this would have been welcomed months ago, most people will be content to accept the good fortune now and let the past go.

Literature.

The American Engineer and Railroad Journal announces that, after Nov. 1, it will be published bi-weekly, instead of monthly, and will appear every other Thursday. The object is to keep more closely in touch with current events. Each number will contain one-half as much reading matter as is now given in the monthly issue, while the price per issue will be reduced to 10 cents.

Report of Proceedings, Second Annual Convention Association of Railroad Air-Brake Men. *Railroad Car Journal*, New York.

This is, as its name indicates, the report of the last convention of this association held in St. Louis last April. It contains a list of the members, the constitution and by-laws of the association, and a list of the subjects to be reported on at the next convention, giving the names of the committee-men.

The Practical Engineer's Pocket Book and Diary, 1896, by W. H. Fowler; 400 pages. Price two shillings. The *Practical Engineer*, Manchester, England.

It is a wonder how this elegant leather-bound, gilt-edge pocketbook, containing over 300 pages of valuable up-to-date rules, tables, data, etc., can be sold for the price named, its contents covering almost every point on which the mechanical engineer, shop manager, draughtsman, or student is likely to require information. Several of the sections have been re-written, while numerous and important additions have been made, including a section of upwards of 50 pages of "Notes on Electrical Engineering."

Guide to Systematic Readings in the Encyclopœdia Britannica. By James Baldwin. 300 pages. Half leather bound. Price $2. The *Morning Herald*, Baltimore, Md.

This is a volume of over 300 pages designed to tell inquirers of every class where to find information in the *Britannica* under the principal heads of knowledge. There are five chapters especially devoted to matters of interest to young people. Fourteen chapters cover readings which will especially attract the student in any of the great branches of knowledge. Thirty-five chapters take up matters of interest to as many different characters of the "busy world," such as the manufacturer, the merchant, the banker, the teacher, the railroad-man, the home-maker, the musician, the journalist, etc. No branch of study or of practical interest has been neglected. The volume is one which no owner of the *Britannica* can afford to miss. It is one also which will easily induce very many who do not own this work to become possessors of it and to give themselves to intelligent use of it.

Railroad Statistics for 1894.

Under the above heading we published in our last issue some statistics from *Poor's Manual* for 1895 showing the track mileage, and cars and locomotives in service at the end of 1894. We have just received an advance copy of the statistical report of the Interstate Commerce Commission for the year ending June 30, 1894. The figures agree pretty well in both publications considering the difference in the periods of time they cover. This is the earliest appearance of any of the Interstate Commerce Commission's statistical reports, and it shows that the railway mileage of the United States on June 30, 1894, was 178,708.55 miles, an increase over the previous year of 2,247.48 miles, or 1.27 per cent. during the year, the percentage of increase being less than in any previous year, although the extensions reported were fairly well distributed over the entire country. The aggregate length of all tracks on June 30, 1894 was 233,533.67 miles, which, in addition to single track mileage, includes 10,499.30 miles of second track, 953.16 miles of third track, 710.99 miles of fourth track and 42,661.67 miles of yard track and sidings. The number of roads abandoned during the year covered by the report is 16, representing an aggregate mileage of 188.05 miles. The number of roads merged, reorganized and consolidated during the year is 51, representing an aggregate mileage of 5,676.97 miles. The following tables show the number of cars and locomotives engaged in the different kinds of service in 1893 and 1894, and the increase in 1894:

LOCOMOTIVES.

	Passenger.	Freight.	Switching.	Unclassified.	Total in service.	Leased.
1894.....	9,893	20,000	5,896	513	35 492	2,512
1893.....	9,697	19,603	4,985	503	34,788	2,014
Increase..	196	397	101	10	704	498

CARS.

	Passenger service.	Freight service.	Company's service.	Total in service.	Leased.	Fast freight line service.
1894.....	33,018	1,205,169	39,891	1,278,078	181,664	44,212
1893.....	32,911	1,201,273	39,762	1,273,946	154,068	34,270
Increase..	107	3,896	129	4,132	27,596	9,942

The report says:

The falling off in the regular increase in railway equipment is one of the marked features of the report, and may be accepted as one of the important results of the business depression to which the railway industry, in common with other industries, was subjected. This decrease in equipment early attracted the attention of the office, and led to correspondence to ascertain the cause and nature of the decrease. In almost every instance the correspondence showed that the railway management made the slackness in business the occasion for destroying a larger number than usual of old cars and cars of inferior type. In some cases, while the number of cars had been decreased, the capacity and value of equipment had been increased. One auditor writes that cars which are now going out of service in large numbers are old cars of 12 or 15 tons capacity, and "are being replaced by cars of 30 tons capacity (equipped with automatic couplers and air-brakes), so that while the number of cars is largely decreased, the tonnage capacity and value of the equipment is increased."

Summaries are presented in the report showing that while the equipment of cars and locomotives in 1894, as compared with 1893, shows an increase of 4,836, the increase in equipment furnished with train brakes during the same period was 31,965, while the increase in equipment furnished with automatic couplers was 35,383. The gain, therefore, in equipment fitted with train brakes during the year was 27,129, and the gain in the equipment fitted with automatic couplers was 30,547. When it is considered

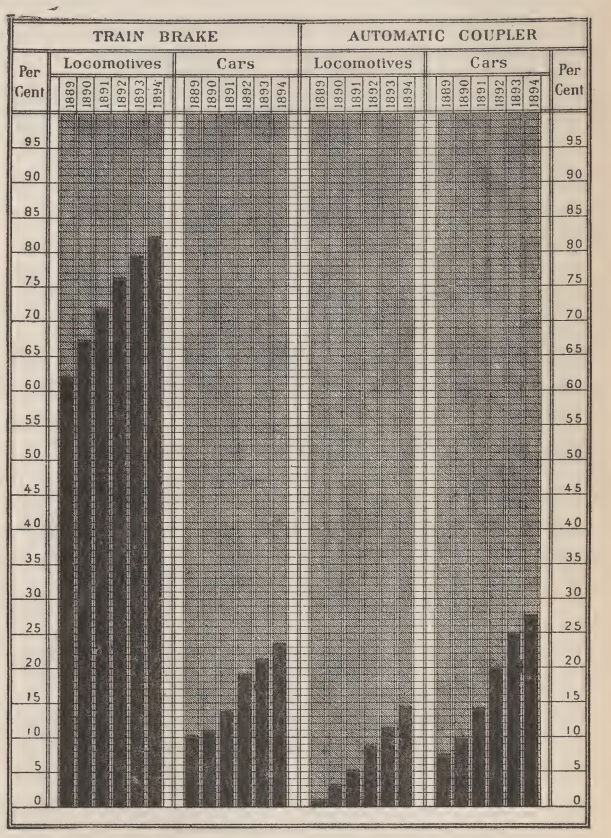


DIAGRAM SHOWING PROPORTION OF ROLLING STOCK FITTED WITH AUTOMATIC BRAKES AND COUPLERS.

that the total equipment on June 30, 1894, was 1,313,570, it is easy to see that greater attention must be given to this matter in the future than in the past, if the railways purpose to comply with the law of March, 1893, which requires all equipment to be fitted with train brakes and automatic couplers by January, 1898.

The accompanying diagram is reproduced from the report, and shows the proportion of equipment, both for locomotives and cars, fitted with train brakes and automatic couplers, and the proportion not fitted with these devices, from 1889 to 1894, inclusive. The black portion of the diagram shows the proportion of the equipment having these appliances, and the shaded portion of the diagram shows the proportion not so fitted.

A New Train Speed Record.

Train speed records do not stand long in these days. We have hardly time to get through talking about one phenomenal locomotive performance before another surpassing it is thrust upon us. The Lake Shore & Michigan Southern is now on top with a record of 510 miles covered in eight hours and one minute, an average, including stops, of 63.60 miles an hour, or, excluding stops, of 64.98 miles an hour. Five Brooks locomotives did the work.

The feat was accomplished Oct. 24, and consisted of a run from 100th street, Chicago, to Buffalo Creek, Buffalo, the outskirts of both cities, with a train of three drawing-room cars weighing, with the engine, 488,500 pounds. A party of railroad officers was aboard. The train left Chicago at 29 minutes and 27 seconds past three o'clock in the morning, and arrived at Buffalo Creek at 30 minutes and 34 seconds past 11 o'clock, 510.1 miles in 481 minutes and 7 seconds, an average speed of 63.60 miles an hour. The following is the official summary: Time lost by five stops, 10 minutes 57 seconds. Time, excluding stops, 510.1 miles in 470 minutes 10 seconds. Average speed, 64.98 miles an hour. Number of slow-downs for railroad crossings, 24; number of other slow-downs, 14.

The run from Chicago to Elkhart was made on a frosty rail, but the 87.4 miles were covered at the rate of 61.32 miles per hour. The run from Elkhart to Toledo, 133.4 miles, was made at the rate of 63.6 miles per hour, and the run from there to Cleveland, 107.8 miles, was made at the rate of 60.96 miles per hour, and Cleveland to Erie, 95.5 miles, was run at 67.01 miles per hour. Four 8-wheel Brooks engines were employed in this work, the engines being changed at the points named. The next run, from Erie to Buffalo Creek, 86 miles, was made by a ten-wheel Brooks engine at the rate of 72.72 miles per hour, which was the fastest running for a like distance made on the trip, and, we believe, the fastest run ever made by a 10-wheel engine. The party of officials that left Chicago on this train went through to New York from Buffalo on the Empire State express, reaching the Grand Central station at 10:15 p. m. After arriving its members found time to visit three theaters while the performances were going on. This was the first time that people have left Chicago in the morning and attended a theatrical entertainment in New York on the evening of the same day.

Personal.

Mr. E. W. Jerome, Master Mechanic of the Zanesville & Ohio River Railroad, has resigned.

Mr. James R. Langdon, Vice-President of the Central Vermont, died in Montpelier, Vt., Sept. 20.

Mr. C. J. Smith, General Manager of the Oregon Improvement Company, has been appointed Receiver.

Mr. A. S. Dunham has been appointed General Manager of the Ohio Southern, with office at Springfield, O.

Mr. R. H. Rosborough has been elected General Manager of the Centralia & Chester, succeeding Mr. G. W. Bartlett.

Mr. George H. Vaillant, formerly Vice-President of the New York, Lake Erie & Western, died at Bristol, R. I., on Sept. 30.

Mr. S. W. Fordyce, President of the St. Louis Southwestern, has been appointed Receiver of the Pine Bluff & Eastern.

Mr. Cecil Gabbett, General Manager of the Albany, Florida & Northern, has resigned, and is succeeded by Mr. J. S. Crews.

Mr. F. D. Thompson has been appointed Master of Machinery of the Monongahela Connecting road, vice Mr. W. R. Nicholson.

Mr. E. La Lime has been appointed Superintendent of the Northern New York Railroad, in addition to his duties as Master Mechanic.

Mr. D. F. Jack, formerly assistant to President H. B. Plant of the Plant System has been appointed Vice-President of the same.

Mr. T. D. Hinchliffe has been appointed General Manager of the Litchfield, Carrollton & Western in place of Mr. H. S. Carroll, resigned.

Mr. G. M. Stewart has been appointed Acting General Manager of the Interoceanic Railroad of Mexico, to succeed Mr. E. W. Jackson, deceased.

Mr. James H. Dewing has been elected Vice-President and General Manager of the Chicago, Kalamazoo & Saginaw, vice W. S. Dewing, resigned.

Mr. Arthur Monnom has been appointed General Manager of the Monterey & Mexican Gulf, succeeding Mr. J. A. Robertson. Mr. H. Nollan becomes Chief of Motive Power.

Mr. H. D. Gordon, Master Mechanic of Juniata shops of the Pennsylvania Railroad, has resigned to accept a position in New York as consulting engineer to a supply company.

Mr. J. A. Fillmore, General Superintendent of the Pacific system of the Southern Pacific, has been appointed Manager of the same, with headquarters at San Francisco.

Mr. P. J. Maguire, General Foreman of the Southern Pacific at Algiers, La., has been appointed Master Car Builder of the Atlantic system, with headquarters at Algiers.

Mr. W. G. Van Vleck, General Superintendent of the Southern Pacific lines in Texas, has been appointed Manager of the Atlantic system, with headquarters at New Orleans.

Mr. J. J. Ryan, General Master Mechanic of the Atlantic system of the Southern Pacific, has been appointed Superintendent of Motive Power of the same with headquarters at Houston, Tex.

In our last issue we announced the promotion of Mr. J. Kruttschnitt to be Second Vice-President of the Southern Pacific. He was also appointed General Manager of both the Atlantic and Pacific systems.

Mr. W. R. Burt, who was appointed receiver of the Toledo, Ann Arbor & North Michigan in 1893, has been elected President of the Ann Arbor Railroad, under which name the former road has been reorganized.

Mr. W. T. Reed, Superintendent of Motive Power of the Seaboard Air Line, has had his headquarters removed from Raleigh, N. C., to Portsmouth, Va., where all the general officers of the company are now located.

Mr. William P. McElroy, Purchasing Agent of the Rio Grande Western, has resigned. The position has been abolished, Mr. Welby, General Superintendent, assuming the direct charge of the purchasing department.

Mr. J. P. McCuen, who has been Master Mechanic of the Queen & Crescent at Ludlow, Ky., has been appointed Superintendent of Motive Power of the Cincinnati, New Orleans & Texas Pacific, with headquarters at Cincinnati.

Dr. J. C. Pohle, well known as the inventor of the Pohle air-lift pump, died in New York Oct. 7. He was born in Berlin in 1829. About 12 years ago he invented his arrangement for raising water, within certain limitations, by the direct use of compressed air.

Mr. J. R. Cade, heretofore General Foreman of the car department at Houston, has been appointed Master Car Builder of the Galveston, Harrisburg & San Antonio, and Texas & New Orleans roads of the Southern Pacific system, with headquarters at Houston, Tex.

Mr. Edward W. McKenna, General Superintendent of the Great Northern has resigned and will give his entire attention to the interests of the Pioneer Rail Renewing Company, which has offices in the Rookery Building, Chicago, and of which Mr. McKenna is President.

Messrs. Edwin H. McHenry, of St. Paul, and F. L. Bigelow, of Milwaukee, have been appointed Receivers of the Northern Pacific, succeeding Messrs. Oakes, Payne and Rouse, resigned. Mr. McHenry has been in the service of the road many years, and has been Chief Engineer since 1893.

Mr. Geo. W. Prescott, Superintendent Motive Power and Car Department of the Southern California Railway, has resigned, and will retire to his orange grove at Highland, San Bernardino County, Cal. He sends us word that he will always be glad to see any of his railroad friends "up at the grove." We are not officially informed who his successor is but feel warranted in saying it is probably Mr. C. F. Lape, recently Railroad Commissioner of Illinois, and formerly for a number of years Master Mechanic of the Wabash Railroad at Springfield, Ill.

Mr. Clarles M. Hays, Vice-President and General Manager of the Wabash Railroad, will resign that office to become General Manager of the Grand Trunk Railway, Jan. 1st, next. Mr. Hays will be succeeded on the Wabash by Mr. Joseph Ramsey, Jr., the present General Manager of the Terminal Railroad Association of St. Louis. Mr. Hays has been General Manager of the Wabash since 1887, when he succeeded Mr. A. A. Talmage. He was born in 1856 and is therefore a young man yet in years, although old in railroad experience, having begun railroad service in 1873 when but 17 years old. For a man so rapidly advanced Mr. Hays is exceedingly modest and unassuming, a courteous gentleman, and totally devoid of that fatal stumbling block to any man's highest success, the "big head." Possessing good judgment, a keen insight into details and a correct sense of justice, he has by the exercise of these qualities brought the service of the Wabash to a high state of perfection, while holding the esteem and good-will of the working force.

The Down Grade.

When the engine is a-puffin',
An' a-snortin' an' a-bluffin',
  Like it mighty ot'en will;
When you hear the thing a-blowin',
Then you know it's hard a-goin',
  For it's climbin' up a hill.

When it goes a-whizzin' by you
In a way that's like to try you
  If you're just a bit afraid;
When it's running fast an' faster,
Like it doesn't need a master,
  Then it's on a down grade.

When you see a man a-workin',
An' his duty never shirkin',
  An' a-sweatin' more or less;
When you see him climbin' higher,
An he never seems to tire,
  He's a-climbin' to success.

When you see one goin' easy,
In a manner light an' breezy,
  Like for pleasure he was made,
Just remember he's a-showin'
That it's mighty easy goin'
  When you're on the down grade.

—*Chicago Evening Post.*

A New Nicaraguan Railroad.

A new railroad is to be built in Nicaragua to connect the Atlantic and Pacific coasts. The government is to furnish the money, and it is said that the work of construction will be conducted under an American engineer.

The only line of railway in the republic at present extends from the port of Corinto to the capital, Managua, thence to Grenada, in the interior. The proposed new road will connect with the present line at a point near Corinto, and will run in a southeasterly direction to the city of Rama, which lies at the headwaters of the Bluefields River, about 60 miles from Bluefields, on the Atlantic coast. As the Bluefields River is navigable for steamers, the new railway will permit shipments of coffee and other native products direct to Rama, from which point they can be sent forward by water to New York or New Orleans at a great saving of time and expense as compared with the present arrangement.

The New York Railroad Club.

This club held its regular meeting Oct. 17. Mr. E. E. Russell Trotman read an interesting paper on Painted vs. Planished Iron Boiler Jackets, in which the use of painted wrought iron for locomotive jackets was strongly advocated.

There was a general discussion on the question of large freight cars. It seemed to be the general impression that the ordinary freight car has nearly, if not quite reached its maximum useful size.

Southern and Southwestern Railway Club.

The next meeting of this club will be held in Macon, Ga. Nov. 21. It will be the annual meeting, at which the election of officers will take place.

The subjects for discussion will be:

1st. "Best Size of Pipes and Connection for Radiating Results of the Baker Heater; Best Liquid to Be Used." Messrs. J. M. Holt and T. S. Lloyd, committee.

2d. "Present State of the Art of Kindling Locomotive Fires with Oils." Messrs. W. L. Tracy, P. H. Screiber and E. T. Silvius, committee.

3d. "The Best and Most Accessible Plan for Applying Air Brakes to Hopper Gondola Cars Having Straight Chutes." Messrs. A. B. Corinth, W. H. H. Price, committee.

4th. "A Durable and Cheap Roundhouse Floor." Messrs. J. T. Robinson and J. G. Tomlinson, committee.

5th. "Inspectors' Gage to Determine the Height of Drawbars." Messrs. Jas. Bossinger and Jas. Maglenn, committee.

The Western Railway Club.

We take the following report from our Chicago contemporary, the *Railway Review*, of the meeting of the Western Railway Club in that city, Oct. 15. President Waitt presided.

A resolution was offered and carried approving the suggestion given the club by Mr. H. S. Haines at the September banquet in regard to extending an invitation to the International Railway Congress to hold a meeting in Chicago prior to the next regular session which is to be held in Paris. It was suggested by Mr. F. A. Delano, of the Chicago, Burlington & Quincy Railroad, that it would be well to consider the advisability of holding an exposition of railway appliances at the time of the meeting of the congress. The matter was referred to the executive committee with power to act. The paper by Prof. Storm Bull upon compound locomotive tests on the Chicago & Northwestern Railway, was then discussed. Criticisms of the tests were offered by several members, and the consensus of opinion seemed to be that only in shop tests could the necessary control of conditions be had to permit of comparisons of different locomotives with sufficient accuracy to determine authoritatively the value of different types in regard to economical workings. The tests were considered as having been carried out in a painstaking manner, but were admitted as being of little value beyond the direct comparison of the two engines employed, this being the real object of the trial. A very ingenious arrangement of apparatus for determining the form of exhaust jets in the smoke-boxes of locomotives was then described in a brief paper by Prof. W. F. M. Goss, of Purdue University, who contributed it in extension of the discussion opened upon the subject of exhaust nozzles by Mr. E. M. Herr at the September meeting. This was followed by a brief topical discussion upon the standardizing of uncoupling devices for freight car couplers. It had been found by one member that the general condition of these attachments upon foreign cars upon his road was better than he had anticipated before making a careful investigation of the subject. Several members wished to see standard attachments decided upon, and others thought that a general strengthening of existing devices would be sufficient. The dangers of trains breaking in two and being derailed by drawbars falling upon the track was considered by one member to be greatly reduced, if not entirely eliminated, by making the parts of the uncoupling devices of sufficient strength to hold up the drawbar in case of breakage of the strap or bolt. This applied to couplers which were unlocked by a vertical movement. The meeting adjourned after the reading of a paper by Mr. J. Snowden Bell upon "Wide Fireboxes in Locomotives."

Varnish for Patterns.

A varnish has been patented in Germany for foundry patterns and machinery, which, it is claimed, dries as soon as put on, gives the patterns a smooth surface, thus ensuring an easy slip out of the mould, and which prevents the pattern from warping, shrinking, or swelling, and is quite impervious to moisture. This varnish is prepared in the following manner: Thirty pounds of shellac, 10 pounds Manilla copal, and 10 pounds of Zanzibar copal, are placed in a vessel which is heated externally by steam, and stirred up during four to six hours, after which 150 parts of the finest potato spirit are added, and the whole heated during four hours to 870 degrees Cen. This liquid is dyed by the addition of orange color, and can then be used for painting the patterns. When used for painting and glazing machinery it consists of 35 pounds of shellac, 5 pounds of Manilla copal, 10 pounds of Zanzibar copal, and 150 pounds of spirit.—*The Practical Engineer.*

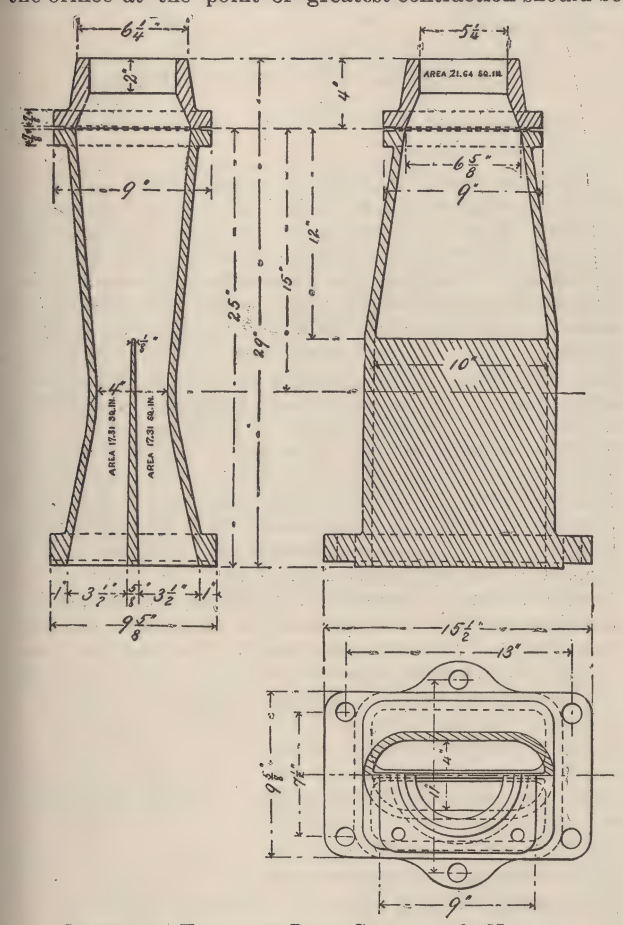
On the Drammen-Skien Railway, in Norway, salt has been used to prevent the growth of weeds along the track and the evil effect of frozen earth in lifting the track.

A rear end collision on the New York, New Haven & Hartford Railroad, near Boston, Oct. 24, caused by defective signals, resulted in the fatal injury to two persons, serious injury to three or four others, while about 20 were slightly hurt.

Exhaust Pipe, Chicago & Northwestern Railway.

The accompanying sectional views show the construction and detail dimensions of an exhaust pipe recently put in use on locomotives on the Chicago & Northwestern Railway. The Assistant Superintendent of Motive Power of this road, Mr. E. M. Herr, in speaking of the pipe at the September meeting of the Western Railway Club, said:

"The contraction shown is for the purpose of still further bringing the flow of steam central to the nozzle. In our older types the bridge was brought just to the height of the contraction. It was found, however, that by doing that the tendency of the steam was still to diverge and make more cross-over in the stack than was obtained by bringing the bridge up higher. We now bring it up to 2 inches or 2½ inches above the center of the point of greatest contraction, and thereby straighten out the flow of the steam and bring it more nearly central with the tip. It was found by the Committee on Exhaust Nozzles of the Master Mechanics' Association, in some experiments, that the area of the orifice at the point of greatest contraction should be



IMPROVED EXHAUST PIPE CHICAGO & NORTHWESTERN RAILWAY.

somewhat less than the area of the exhaust tip; otherwise there was more or less back pressure in the opposite cylinder, and the proportion finally determined upon was 80 per cent. of the area of the exhaust tip at this point. We use a 5¼-inch diameter nozzle, an area of 17.31 at the point of greatest contraction, against an area of 21.64 inches in the tip. The pipe is not very high. The boiler of this engine has a 63-inch shell and the nozzles are somewhat lower than the center of the boiler. The other view of the pipe shows the broadening of the lower part and the gradual narrowing up to the tip while it gradually widens in the other section, keeping the volume comparatively uniform in this part of the pipe.

The form of the tip, we find, has a great deal to do with the character of the exhaust and with the effect upon the fire. The form of tip here shown produced a different kind of a jet of steam than would be caused by bringing this up straight and allowing a projection, a sort of lip, on the inside. This produces more of a contraction of the stream of steam right at the orifice, and a subsequent broadening spreads the steam more, and at the same time has the effect upon the cylinder as though the orifice was made smaller. I think that may be the reason why engineers often say that their engines steam better with a lip on the nozzle with the same sized orifice, because the effect of the lip is to practically contract the orifice and give a more intense blast, and at the same time spread the steam, and may have the effect of better filling the stack, but it certainly increases the back pressure more than the nozzle made of the form shown here.

"The engines equipped with this nozzle have been so short a time in service that it is difficult to say what performance they are giving, but on a large number of engines in the last six months fitted with this design of pipe and nozzle we have obtained very much better results than with the old type of pipe. How much benefit was due to this particular design and how much to the lowering of the nozzle, I do not know, but the engines certainly have been giving very much better results with the new type of nozzle. I can say this, however, that the indicator cards show a very great freedom from back pressure with this nozzle, much more than they do with the old style with the same opening. I think that is due, perhaps, to the better design of the bridge. You will notice, if you compare the area of the circles, that the area at the point of greatest contraction is equal to about a 4 11/16 inch double nozzle, which would be a pretty good sized double nozzle to run on a 19-inch engine."

Convention of Superintendents of Bridges and Buildings.

The fifth annual meeting of the Association of Railway Superintendents of Bridges and Buildings was held in New Orleans, La., Oct. 15 to 17. President George W. Andrews (Baltimore & Ohio), presided. The roll call showed about fifty members present, in addition to a large number of visitors, chiefly prominent railroad officials from New Orleans and vicinity. Seven new members were enrolled.

The annual address of President Andrews dwelt chiefly on the prosperity of the Association, the important position it was gradually assuming among other kindred railroad associations, and the necessity for publication of advance copies of committee reports for distribution among members and the technical press prior to the holding of the annual convention, which recommendation was subsequently adopted by the Association.

Reports on the following subjects were presented: Methods and special appliances for building temporary trestles over washouts and turnouts. Strength of various kinds of timber used in trestles and bridges, especially with reference to Southern yellow pine, white pine, fir and oak. Best method of erecting plate girder bridges. Sand dryers, elevators and methods of supplying sand to engines, including buildings. Best method of spanning openings too large for box culverts in embankments too low for arch culverts. Pumps and boilers.

The discussions on "Erecting Plate Girders," on "Sand Drying Establishments," on "Pumps and Boilers," and on "Spanning Wide Low Culvert Openings," brought out prolonged debates. The principle of erecting plate girders alongside of the running track and sliding into place on greased rails was considered the best for general recommendation. The use of old rails, covered with concrete and ties laid in ballast, is the most preferable method of spanning wide low openings on permanent work, while trestles or a series of timber boxes will solve the problem for temporary work or for the first construction of new roads. Pumps and boilers and sand drying plants were thoroughly discussed, while the very valuable and practical report of Mr. R. M. Peck, of the Missouri Pacific, and the carefully prepared report of Mr. Walter G. Berg, on 'Strength of Bridge and Trestle Timbers," were carefully considered.

The subjects for reports and discussion at next year's convention are as follows:

How to determine size and capacity of openings of waterways.
Different methods of numbering bridges; should all waterways be numbered?
Drawbridge ends: methods of locking, and under this head include locking of turntables.
Protection of trestles from fire, including methods of construction.
Local stations for small towns and villages, giving plans of buildings and platforms.
Tanks—size, style and details of construction, including frost-proof protection to tank and pipes.
Shearing of rivets in plate girders and cause thereof.
Best and uniform system of report blanks for bridge and building department.
Protection of railroad structures and buildings from fire.
Mechanical action and resultant effects of motive power at high speed on bridges.
Best and most economical railway track pile driver.
Span limits for different classes of iron bridges and comparative merits of plate-girders and lattice-bridges.

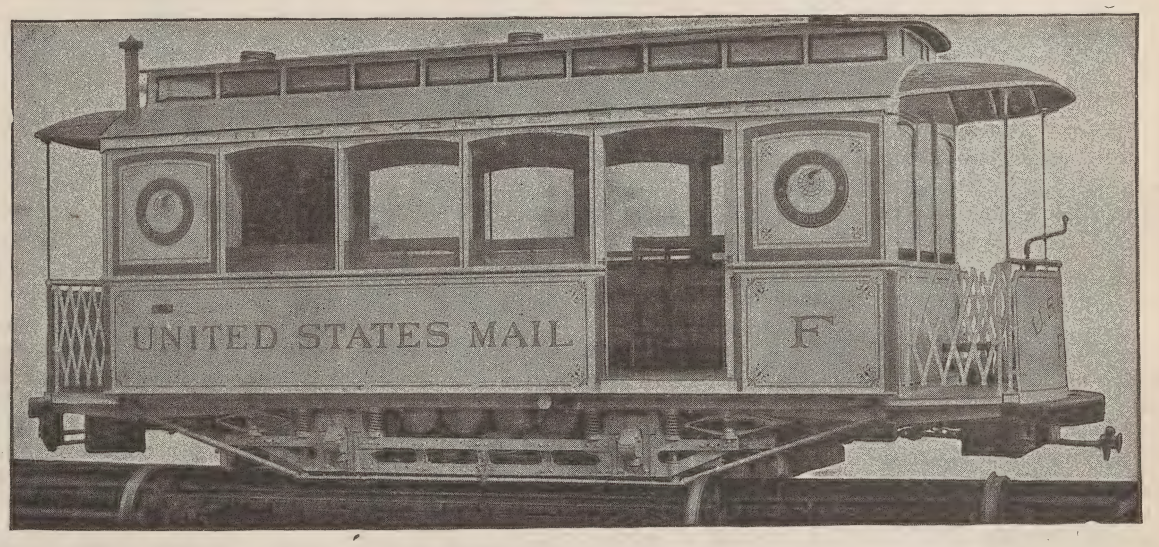
The following officers were elected for the new year: President, W. A. McGonagle, Duluth & Iron Range; First Vice-President, L. K. Spafford, Kansas City, Fort Scott & Memphis; Second Vice-President, James Stannard, Wabash; Third Vice-President, Walter G. Berg, Lehigh Valley; Fourth Vice-President, Joseph H. Cummin, Long Island; Secretary, S. F. Patterson, Boston & Maine; Treasurer, George M. Reid, Lake Shore & Michigan Southern.

The convention adjourned to meet next year in Chicago, Ill., on the third Tuesday in October.

This association, which has now passed its fifth anniversary, bids fair to become, with respect to the bridge and building department of railroads, of as much importance and national influence as the master car builders', the master mechanics', the roadmasters' and similar associations in their respective departments. The membership is composed of officials in charge of the construction and maintenance of bridges and buildings on the railroads throughout the United States, with representatives from Mexican and Canadian roads, and deserves the hearty support of all railroad managements.

Street Railway Postal Car.

The accompanying illustration shows one of several new postal cars adapted for street railway mail service and put in use on the Third Avenue cable line in New York, Oct. 1. By these cars a half-hourly service is established between the general post-office and the 149th street substation between 5 a. m. and 8:30 p. m. They serve 13 branch offices. They are 22 feet long and are painted white on the ouside, with gilt trimmings. The interior is fitted up with distributing pigeon holes, assorting tables and racks for mail pouches. The illumination provided is Pintsch gas. They are run on the regular cable trains, and are switched on and off by horses.



A Street Railway Postal Car.

Freight Cars of 80,000-Pound Capacity.

The following timely discussion of the prospects of freight cars of 80,000 pounds capacity took place at the last meeting of the Southern and Southwestern Railway Club, during which Secretary Charpiot outlined in a very intelligent way the conditions that will probably soon lead to the use of such cars:

Mr. CHARPIOT: It is gratifying to see that in the matter of 80,000-pound cars the Master Car Builders' Association has foresight enough to nominate a committee to see about selecting proper standards for that character of construction. The evolution of the 50,000 and 60,000-pound car, as we all know, took place before the Master Car Builders considered any of the elements of that construction, and the result has been a great diversity of opinion in regard to all details of construction and size of material, so that by the time the association established standards the country was filled with the character of mongrel stock which is still with us.

Mr. E. C. SPAULDING: Is there any necessity for 80,000 pound cars?

Mr. CHARPIOT: The advisability of using 80,000 pound cars may be a subject for discussion, but, owing to the fact that a great many kinds of cargoes are of great specific gravity, and that the average cubic contents of the common car are capable of carrying fully 80,000 pounds, we have no doubt that before long such cars will be built, as economy in trackage and room, which seems to be the order of the day will surely bring out efforts in that line. It must be manifest to every one who has given the matter any thought, or reviewed the past history of car construction, that this is a timely and wise action, to establish standards now for future use, as all standards at best are useful only during a comparatively short period of time, and the only way their usefulness can be prolonged is by extending their probable use by meeting future requirements. The subject is, no doubt, capable of extensive study and a critical analysis of the various members that are capable of composing a construction that will be perfectly adequate to carry 80,000 pounds of cargo. No doubt the results of the investigation of the committee will bring about the most economical design for construction and maintenance, with the greatest possible factors of safety in all the various working parts. It will also establish a more universally accepted design than we have heretofore been able to use from the very fact spoken of before, that standards were generally made after the great bulk of construction of any character had been completed.

Mr. SPAULDING: What will be the effect on the track and bridges? Would not such a car be unsafe to the track and bridges?

Mr. CHARPIOT: We have thought of that, but in view of the fact that a good many of our engines weigh 80 or 90 tons it seems there would be no danger in a gross weight of 55 tons. Heretofore, as the size of the engines has increased, heavier rails have been put down. The track and bridges have been strengthened. It will be a sort of gradual growth. Already the demand is for large loads in cars. The rates of freight, and to avoid trackage and shifting, compel us to carry as much as possible in one car. These are the reasons, we believe, that will induce some one to construct an 80,000 pound car. Ores and phosphates are the thorns in our flesh, any cargo of great density to the cubic foot.

Mr. SPAULDING: I have received a letter asking in regard to building gondolas of 80,000 pounds capacity. I find that 40,000-pound cars are taken under protest by the shippers; they demand a heavier car. I think what you say is very timely. We ought to determine on the standard before the cars are built.

A Strongly Trussed Passenger Car.

The engravings on this page are reproduced from drawings sent us by Mr. Henry Pearson, Superintendent of the Wason Car Company, of Springfield, Mass., and show a form of construction designed and patented by Mr. Pearson for increasing the strength of the frame of the car body. Incidentally the construction also gives considerable room for the storage of berths, bedding or baggage, or any other articles desirable. Such cars are known as "drop bottom" cars, and in the South, "possum-belly" cars. Referring to the engravings, figure 1 is a side view of a car having the form of construction proposed by Mr. Pearson. Figure 2 is a side view of a portion of the car body on an enlarged scale. Figure 3 is an inverted plane showing the parts of figure 2 immediately above figure 3. Figure 4 is a vertical longitudinal section through the side sills at and along one side of the frame of the car body. Figure 5 is a vertical cross-section of figure 4 near the end of the extension. The construction is so plainly shown that further description is unnecessary. The chief object is evidently to attain greater strength and rigidity, these seem inherent in the design.

Fig. 1

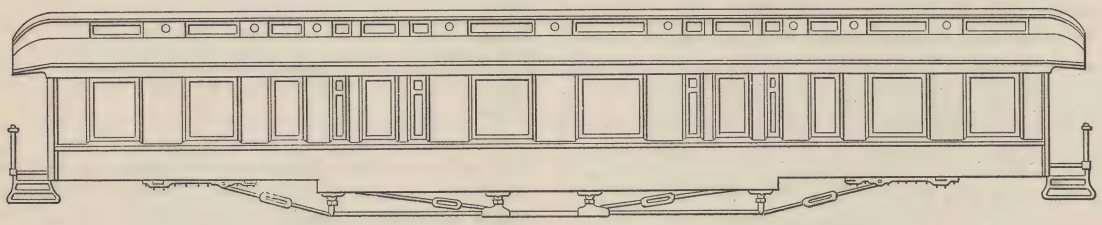


Fig. 2

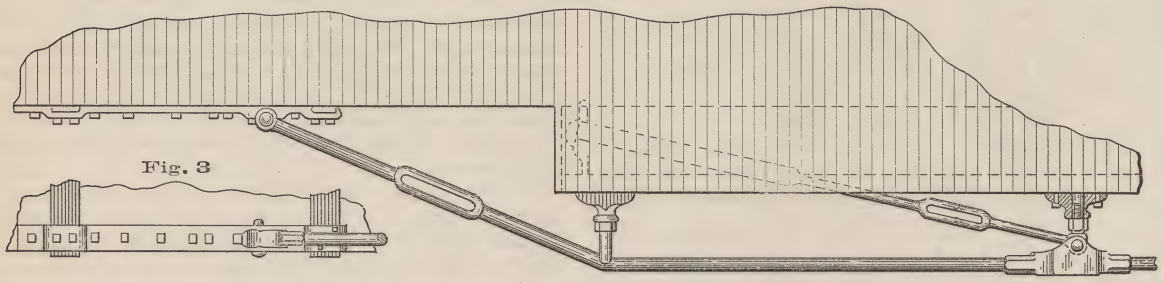


Fig. 3

Fig. 4

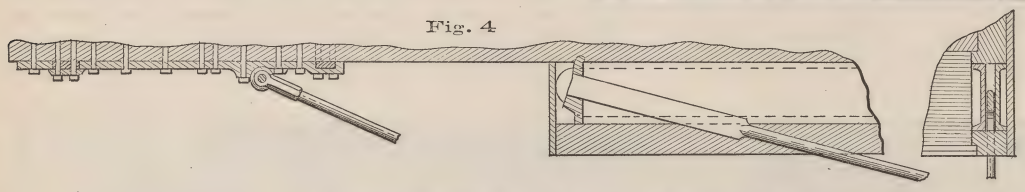


Fig. 5

Improved Design of Trussing Passenger Cars.

President Roberts' Hopeful View.

President George B. Roberts and the directors of the Pennsylvania Railroad returned Oct. 26 from the annual tour of inspection, in which the entire system controlled by the corporation was traveled over. In speaking of his trip President Roberts said:

"There has been a remarkable improvement in the business situation in both the East and West during the last few months. Business of all kinds is better and the winter gives promise of a still greater increase in activity in all directions. The renewal of prosperity was striking especially in the West, where the farmers have had an unusually large corn crop. Our road has been greatly improved in every respect since the last annual inspection, but still there is always opportunity for improvement. On the eastern system the principal work contemplated is a continuation of the revision and straigthening of the lines. We propose to take out more of the curves, and in fact all that we pos sibly can.

"In the West, we will lengthen our double track and add to the equipment in various ways. We have ordered 6,000 freight cars, which will be built and delivered during the year. At Pittsburgh we contemplate the building of a new freight station, and at Columbus, Ohio, a similar structure will shortly be erected. The bridge over the Ohio River from Newport to Cincinnati will be completed during the winter."

The views held by Mr. Roberts of the improved condition of business are amply justified by the facts. The improvement is quite general, and embraces nearly all kinds of business and nearly all localities. Reports of the gross earnings of 69 railroads for the second week in October show that of these 50 return gains of $682,046, or 10.2 per cent., and 19 return losses of $170,525, or 11.8 per cent. The whole showing a gain of $511,521, or 6.3 per cent. Reports show that the gross earnings of 42 railroads or systems for the third week in October, 31 return gains of $511,464, or 11.3 per cent., and 11 return losses of $156,778., or 11.7 per cent. The whole shows a gain of $354,686, or 6 per cent.

Train robbers have been unusually active in October, and several attempts to wreck passenger trains have been made, the worst being that to wreck a Baltimore & Ohio express train at Cochran, Ind., Oct. 9. A dynamite cartridge was placed on the inner rail of a curve and exploded by the engine. The train passed safely, thanks to the ignorance of the robbers. Common sense calls loudly for capital punishment for train robbing and wrecking, even attempted wrecking.

Washing Boilers With Hot Water.

The following is an abstract from an interesting report made on this subject to the Southern and Southwestern Railway Club at its last meeting by a committee consisting of Messrs. John Dempsy, G. D. Harris and J. T. Robinson:

Great variations in temperature superinduce a multiplicity of defects in boilers, and no doubt every one will readily regard as true the proposition that boilers should be washed and filled with hot water as a rule and not as an exception. Your committee believes that where the demand for hot water is small, some device, like the ejectors now on the market, will serve a good purpose at a comparatively small cost, and possibly with more or less success, accordiug to the conditions. No doubt it will be found that to furnish an abundance of water in a large roundhouse, where many engines have to have their boilers washed and filled, a plant for that special purpose would prove the most economical and satisfactory. What such a plant would consist of must of necessity vary materially in each case, and your committee has not been able to gather any special information for the present. The Norfolk & Western Railroad is making use of a plant which Mr. Sanderson graphically describes as follows:

"Numerous efforts have been made on our road to accomplish the washing of boilers with hot water with varying success, but as the boilers of our locomotives became larger, arrangements which were at one time found to be sufficiently powerful have proved of too small capacity and we have been forced to make changes. After various experiments and trials, we have about come to the conclusion that a plant as outlined below is the best for use at large roundhouses, where much boiler washing has to be done, and where the locomotive boilers to be washed are of large capacity, especially where the water used in the locomotive boilers gives trouble on account of formation of mud and scale. The plant referred to consists of the regular shop boiler, having sufficient capacity to furnish steam for the stationary engine, steam heat, etc. Alongside of this boiler is a second boiler, or auxiliary boiler, generally a boiler from a cut-up locomotive. In addition to the two boilers referred to there is a steam pump such as is ordinarily used at a well-equipped water station for pumping water into the tanks. The cold water from the mains is forced by this steam pump through the auxiliary boiler and into the roundhouse pipe service, the cold water being taken in at the bottom of the auxiliary boiler, generally at the mud drum at the front, and the heated water passing to the roundhouse from the top of the dome. The roundhouse water service is kept under constant pressure, steam being kept on the pump at all times. A Westinghouse governor is applied to the steam pipe furnishing steam to the bottom and a small connection made from the top of the governor to the top of the air barrel on the steam pump, so that when the plug cock or valve in the roundhouse is opened, as is the case when the men commence to wash a boiler, the pump starts up, due to the reduction in pressure, and the greater the volume of water used the faster the pump will run.

"A banked fire is ordinarily kept in the auxiliary boiler which keeps the water in it heated to such a degree that men can just handle a hose and fittings without being scalded or burned. When the man who attends to the stationary boiler notices the pumping commencing to run, as it will do automatically when the water is turned on in the roundhouse, he stirs up the fire, closes the door and opens the dampers. If the demand for water continues for a long while, he can also turn on the blower in the stack. As soon as the pump ceases running, which will occur when the water is shut off in the roundhouse, he can open his fire door, close the dampers, shut off the blower and bank the fire without having to have any signal transmitted to him from the roundhouse. This arrangement has proved eminently satisfactory where we have used it; having found that boiler washers, 'injectors,' 'heaters' and other devices of this kind which we have tried extensively were of insufficient capacity to furnish the volume and pressure of water needed for washing out large boilers and driving the scale out of them, as well as being very wasteful in the steam used to work them. In case of a breakdown to the regular shop boiler, a byepass arrangement fitted between the discharge from the steam pump leading to the boiler and the pipe leading to the roundhouse is cut in and the valves which are placed at the mud drum and at the dome top are shut, enabling us to force cold water direct to the roundhouse for washing and filling and thus enabling us to use the extra boiler while repairs are being made on the regular shop boiler; of course, during this interim we are deprived of the hot water in the roundhouse, but this cannot be avoided unless it is considered worth while to have a boiler solely for heating the water as well as an extra shop boiler. We have found that small heaters such as are used for heating the feed water for boilers are of entirely insufficient capacity, and it requires a good sized locomotive type of boiler to hold the volume of hot water sufficient to make a real efficient apparatus."

Inquiries have been made about the use of small devices to be used when a plant of any magnitude cannot be afforded, and your committee believes that a separate boiler, located at some convenient and accessible point, should furnish steam necessary to operate whatever device may be used.

Use and Abuse of the Monkey Wrench.

A correspondent in the *American Machinist* in discoursing on this subject says:

A monkey wrench is susceptible of hard work and a long life if properly handled, and is just the reverse if improperly handled. How many mechanics are there who appreciate that there is but one way to use a wrench of this kind and not abuse it? Judging from observation, I venture to say that not 50 per cent. stop to think but that the wrench will stand as much wrenching one way as another, yet a glance at the scrap pile or a walk around among the benches of a shop will show you that somebody has abused the monkey; and it goes without saying that some manufacturer has been correspondingly cussed because he made such poor tools. I believe you will find that nine out of ten wrenches that give out, break in the back of the eye to the movable jaw at *A*, and this only occurs when you *pull up* on the wrench when placed as in Fig. 1, and never when forcing down, as in Fig. 2. If circumstances are such that you must pull up, then turn your wrench over, and you get the effect of Fig. 2, which is the only proper one, excepting, of course, certain contingencies when one has no choice, and then you must take the chances of a broken wrench. The diagram drawn on the two wrenches, Figs. 1 and 2, shows where the strains are transmitted when the wrench is properly used, as in Fig. 2, or abused, in Fig. 1. These strains are increased or decreased, according as the wrench is made to fit the nut on which you are wrenching; and the practice that some mechanics have of only approximately setting the wrench to fit, is not only bad for the corners of the nut or head, but is bad for the wrench also.

The esteemed contemporary from which we republish the foregoing warmly comments on it as follows:

Nothing, probably, has exasperated us more in the course of our mechanical life than the abuse of the monkey wrench. The customary abuses which our correspondent cites are mostly of such a character that they can be attributed to an ignorance of mechanical principles, or at the worst, to thoughtlessness. We could have wished that he had gone a little farther, and shown by actual computation how great is the strain thrusting the jaws of a wrench apart when it is not closed tightly upon the nut or bolt head operated upon. The abraded corners of tap and reamer heads are in evidence in too many shops upon this point, and the worn surfaces of the wrench jaws themselves tell the same story.

But in addition to the sins of ignorance and thoughtlessness, the monkey-wrench fiend continually perpetrates

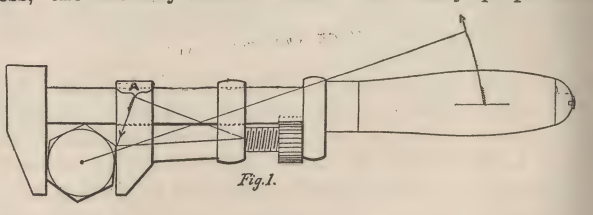


Fig. 1.

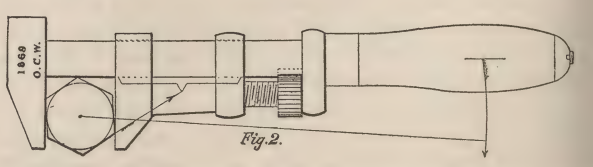


Fig. 2.

others that are willfully and wantonly destructive. There is the use of the wrench for a hammer. It injures and soon ruins the wrench, and the wrench always mutilates what it is applied to, while it only remotely accomplishes the duty intended. The makers of wrenches are more or less to blame for this practice in continuing to make the head of the wrench in a shape suggestive of a hammer. Metal would be saved by changing the shape, and hammering with the wrench might be rendered practically impossible.

No one ever put a pipe on the handle of a wrench to get a greater purchase that was not guilty of deliberate wrongdoing. Ignorance or thoughtlessness have nothing to do with a case of that character. But the worst crime against the wrench that fiendishly ingenious malignity has ever invented is that of hammering on the back of the handle ferrule. It makes a real mechanic's blood boil to see such an operation as that. Eternally blasted should be the mechanical reputation of any man who could acquiescently stand by and see such an atrocity committed. Incredible as it may seem, however, there is an aggravation that may still be piled upon it all. It is for a man to tell you that it is his own wrench! An outrage is an outrage, and though in our own person or pocket we do not suffer it, we still have sympathies that cannot be entirely benumbed.

Strength of Timbers.

A committee of the Association of Superintendents of Bridges and Buildings, composed of Messrs. Walter G. Berg, J. H. Cummin, John Foreman and H. L. Fry, rendered a report to the late convention of this association on the above-named subject, that, while particularly applicable to the use of timbers in bridges and trestles, also contains information of interest and value to all extensive users of wood. Therefore we present herewith a short abstract of the report:

Small-size specimen tests give much larger average results than full-size tests, owing to the greater freedom of small selected test pieces from blemishes and imperfections, and their being, as a rule, comparatively drier and better seasoned than full size sticks. The exact increase is from 10 to over 100 per cent. The test data at hand, and the summary criticisms of leading authorities, seem to indicate the general correctness of the following conclusions:

Variations in strength are generally directly proportional to the density or weight of timber.

As a rule, a reduction of moisture is accompanied by an increase in strength; in other words, seasoned lumber is stronger than green lumber.

Structures should be, in general, designed for the strength of green or moderately seasoned lumber of average quality, and not for a high grade of well-seasoned material.

Age or use do not destroy the strength of timber, unless decay or season-checking takes place.

Timber, unlike materials of a more homogeneous nature, as iron and steel, has no well-defined limit of elasticity. As a rule, it can be strained very near to the breaking point without serious injury, which accounts for the continuous use of many timber structures with the materials strained far beyond the usually accepted safe limits. On the other hand, sudden and frequently inexplicable failures of individual sticks at very low limits are liable to occur.

Knots, even when sound and tight, are one of the most objectionable features of timber, both for beams and struts. The full-size tests of every experimenter have demonstrated not only that beams break at knots, but that invariably timber struts will fail at a knot or owing to the proximity of a knot, by reducing the effective area of the stick and causing curly and cross-grained fibers, thus exploding the old view that sound and tight knots are not detrimental to timber in compression.

Excepting in the top logs of a tree or very small and young timber, the heart-wood is, as a rule, not as strong as the material farther away from the heart. This becomes more generally apparent, in practice, in large sticks with considerable heart-wood cut from old trees in which the heart has begun to decay or been wind shaken. Beams cut from such material frequently season-check along middle of beam and fail by longitudinal shearing.

Top logs are not as strong as butt-logs, provided the latter have sound timber.

The results of compression tests are more uniform and vary less for one species of timber than any other kind of test; hence, if only one kind of test can be made, it would seem that a compressive test will furnish the most reliable comparative results.

Long timber columns generally fail by lateral deflection or "buckling" when the length exceeds the least cross-sectional dimension of the stick by 20, in other words the column is longer than 20 diameters. In practice the unit stress for all columns over 15 diameters should be reduced in accordance with the various rules and formulæ established for long columns.

Uneven end-bearings and eccentric loading of columns produce more serious disturbances than usually assumed.

The tests of full-size long compound columns, composed of several sticks bolted and fastened together at intervals, show essentially the same ultimate unit resistance for the compound column, as each component stick would have, if considered as a column by itself.

The aim of your committee has been to examine the conflicting test data at hand, attributing the proper degree of importance to the various results and recommendations, and then to establish a set of units that can be accepted as fair average values, as far as known to-day, for the ordinary quality of each species of timber, and corresponding to the usual conditions and sizes of timbers encountered in practice. The difficulties of executing such a task successfully cannot be overrated, owing to the meagerness, and frequently the indefiniteness, of the available test data, and especially the great range of physical properties in different sticks of the same general species, not only due to the locality where it is grown, but also to the condition of the timber as regards the percentage of moisture, degree of seasoning, physical characteristics, grain, texture, proportion of hard and soft fibers, presence of knots, etc., all of which affect the question of strength.

Your committee recommends, upon the basis of the test data at hand at the present time, the average units for the ultimate breaking stresses of the principal timbers used in bridge and trestle constructions shown in the accompanying table.

AVERAGE ULTIMATE BREAKING UNIT STRESSES, IN POUNDS PER SQUARE INCH.

Kind of Timber.	Tension.		Compression.			Transverse rupture.		Shearing.	
			With grain.						
	With grain.	Across grain.	End bear'g.	Columns under 15 diams.	Across grain.	Extreme fiber stress.	Modulus of elasticity.	With grain.	Across grain.
White oak	10,000	2,000	7,000	4,500	2,000	6,000	1,100,000	800	4,000
White pine	7,000	500	5,500	3,500	800	4,000	1,000,000	400	2,000
Southern, Long-leaf or Georgia yellow pine	12,000	600	8,000	5,000	1,400	7,000	1,700,000	600	5,000
Douglas, Oregon and Washington fir or pine. Yellow fir	12,000	.....	8,000	6,000	1,200	6,500	1,400,000	600	.....
Douglas, Oregon and Washington fir or pine. Red fir	10,000	.....	.....	.....	.....	5,000	.....	.....	.....
Northern or short-leaf yellow pine	9,000	500	6,000	4,000	1,000	6,000	1,200,000	400	4,000
Red pine	9,000	500	6,000	4,000	800	5,000	1,200,000	.....	.....
Norway pine	8,000	.....	6,000	4,000	800	4,000	1,200,000	.....	.....
Canadian (Ottawa) white pine	10,000	.....	.....	5,000	.....	.....	.....	350	.....
Canadian (Ontario) red pine	10,000	.....	.....	5,000	.....	5,000	1,400,000	400	.....
Spruce and Eastern fir	8,000	500	6,000	4,000	700	4,000	1,200,000	400	3,000
Hemlock	6,000	.....	.....	4,000	600	3,500	900,000	350	2,500
Cypress	6,000	.....	6,000	4,000	700	5,000	900,000	.....	.....
Cedar	8,000	.....	6,000	4,000	700	5,000	700,000	.....	1,500
Chestnut	9,000	.....	.....	5,000	900	5,000	1,000,000	600	1,500
California redwood	7,000	.....	.....	4,000	800	4,500	700,000	400	.....
Californiaspruce	.....	.....	.....	4,000	.....	5,000	1,200,000	.....	.....

AVERAGE SAFE ALLOWABLE WORKING UNIT STRESSES IN POUNDS PER SQUARE INCH.

Kind of Timber.	Tension.		Compression.			Transverse rupture.		Shearing.	
			With grain.						
	With grain.	Across grain.	End bear'g.	Columns under 15 diams.	Across grain.	Extreme fiber stress.	Modulus of elasticity.	With grain.	Across grain.
Factor of safety	Ten.	Ten.	Five.	Five.	Four.	Six.	Two.	Four.	Four.
White oak	1,000	200	1,400	900	500	1,000	550,000	200	1,000
White pine	700	50	1,100	700	200	700	500,000	100	500
Southern, long-leaf or Georgia yellow pine	1,200	60	1,600	1,000	350	1,200	850,000	150	1,250
Douglas, Oregon and Washington fir or pine.. Yellow fir	1,200	.....	1,600	1,200	300	1,100	700,000	150	.....
Douglas, Oregon and Washington fir or pine.. Red fir	1,000	.....	.....	.....	.....	800	.....	.....	.....
Northern or short-leaf yellow pine	900	50	1,200	800	250	1,000	600,000	100	1,000
Red pine	900	50	1,200	800	200	800	600,000	.....	.....
Norway pine	800	.....	1,200	800	200	700	600,000	.....	.....
Canadian (Ottawa) white pine	1,000	.....	.....	1,000	.....	.....	.....	100	.....
Canadian (Ontario) red pine	1,000	.....	.....	1,000	.....	800	700,000	100	.....
Spruce and Eastern fir	800	50	1,200	800	200	700	600,000	100	750
Hemlock	600	.....	.....	800	150	600	450,000	100	600
Cypress	600	.....	1,200	800	200	800	450,000	.....	.....
Cedar	800	.....	1,200	800	200	800	350,000	.....	400
Chestnut	900	.....	.....	1,000	250	800	500,000	150	400
California redwood	700	.....	.....	800	200	750	350,000	100	.....
California spruce	.....	.....	.....	800	.....	800	600,000	.....	.....

Electricity as a Motive Power for Surface Railways.

At the September meeting of the Western Railway Club Mr. L. B. Stillwell spoke on this subject and said:

Animal power aside, there are but two ways to propel a car; first by the storage system, in which the car or locomotive carries energy in a stored form—usually coal—and is equipped with the mechanism necessary to transmit that stored energy into the energy of motion. Second, transmission systems, in which the energy is developed at a central station, and transmitted to the moving cars by cables, electric conductors or other means. We claim that to-day the storage system at its best—for example, as used in the best coal-burning locomotive in America—is far from ideal; that for every horse power so used to draw a train, 20 horse power are wasted. We claim that to a man in a balloon the pathways of transportation all over this broad country are marked by black lines of smoke forming hieroglyphs—the meaning of which is that we do not know how to efficiently utilize our supplies of energy. We claim that to the same man in the balloon many of our largest cities are to-day simply black spots upon the landscape, emphasizing a thousand times the fact that our boasted nineteenth century science does not know how to use the energy of coal. We claim that one great reason why the storage system has been so developed and established that transmission systems have difficulty in obtaining recognition, even under the most favorable conditions—namely, in cities and their immediate vicinities—is the fact that we have until recently lacked an ideal agent for transmission. We claim that electricity is an ideal agent; that its laws are well understood; that our knowledge is now sufficient to enable us to apply it to the problem of traction in cities without risk of failure, and with assurance of success. We point to the fact that for several years energy transmitted 28 miles by electricity has been commercially used with absolute success; that experimentally transmission over more than 100 miles has been accomplished; and that the range of efficient transmission is steadily increasing.

Without attempting an elaborate comparison of the relative advantages of electricity, cables, compressed air, and water, it is interesting and instructive to note what changes in the characteristics of these latter three agents we should wish for to make them more effective for transmitting and distributing power. We should wish for a rope that would never stretch and never break; that should weigh nothing; that might be readily subdivided, each strand continuing to transmit its proper proportion of power; that could turn corners without using pulleys. We should wish for water that could, at pressures safely and easily controlled, transmit large amounts of energy through pipes of moderate size and cost; that should weigh nothing, and that should never freeze. We should wish for air that should not lose by friction when forced through pipes, and that should not loose energy by reduction of temperature. And when we had wished all these, and found our wish realized, we should have something very like electricity. Electricity never stretches, never breaks, weighs nothing, can be subdivided indefinitely with great ease, can turn corners without loss. It can transmit large amounts of energy at pressures easily controlled along wires of moderate size, and it never freezes. Its loss by friction is comparatively insignificant, and its other losses in comparison with every other known agent are almost negligable.

It is interesting to note that in employing electricity we are using not a solid, not a liquid, not a gas, but ether—that mysterious something which, as modern science teaches, panetrates all matter and fills all space. We cannot accurately define electricity, but this much at least is known. Electricity has to do with the same medium that transmits light; it is as swift as light, and stronger than steel; it weighs nothing, and yet if compressible at all it is certainly less compressible than any known material. An impulse, let us say, a push applied to one end of a circuit in Chicago is instantly felt at the other end in New York. We have within a few years come to recognize electricity as the nerve system of civilization. We are just beginning to realize that it is also muscle. We may hope that at no distant day great systems of electric conductors, noiseless, motionless, giving no sign of the work they are doing, radiating from central stations suitably located, will propel every car and train, and every wheel of industry in our cities.

Power can be far more economically developed in large quantities than in small, even where coal is the source from which it is derived, and, making all allowances for losses in transmission through conductors and conversions in motors, it is cheaper to-day, so far as the cost of power is concerned, to propel suburban trains by electric motors than by steam locomotives; and where a transmission system is adopted it becomes possible to utilize any cheap power which may be found within reasonable distances—say twenty-five or even fifty miles. It is entirely within the limits of possibilities of electric traction as now developed, to operate trains within the city limits of Chicago by power transmitted from the drainage canal near Joliet.

But to my mind an argument more weighty than that of improved efficiency or greater flexibility and convenience in handling traffic is that of the resulting cleanliness, and consequently improved conditions of life in our great cities. I believe it to be one of the missions of electricity to eliminate smoke and let in the sunlight.

In view of the facts to which I have briefly referred, we are, I think, justified in concluding that a broad view of the situation indicates that electric traction is destined to generally supersede all other systems of traction in our large cities and their suburbs. To what extent electric traction will, in time, compete with steam in cross-country service it is yet too early to say, but if I may be allowed to express my personal opinion, I should say that where distances are great and traffic comparatively light, it will be a long time before steam locomotives are superseded. For the cities, however, the change cannot well come too soon. It is true that the best means of transmitting power from the central station to the moving car has not been conclusively fixed upon. The overhead trolley, the conduit, and the system in which contact points under the moving car are charged as the car passes, and discharged when the car has passed—these, and, perhaps, others, are to-day in practical operation, and in no small degree successful; but they have not been in use for a sufficient length of time to make it clear that any one is distinctly superior to its competitor—in fact it is altogether probable that here, as well as elsewhere, we shall find that no one system is best for all cases—that various methods must be employed to meet different conditions.

But while much remains to be demonstrated as regards the particular methods employed for transmitting energy from the central station, and delivering it to the car, enough has been accomplished—the invasion of the field hitherto occupied by steam is already sufficiently formidable to call for most careful consideration upon the part of practical railroad men.

A Settlement in Sight for Northern Pacific Affairs.

On Oct. 29 it was announced that a general agreement upon Northern Pacific Railroad matters is upon the point of completion. Arrangements are, it is said, being perfected for harmonious action of the United States Judges of Wisconsin, Dakota, Montana, Washington, Idaho and Oregon for a union upon one or more receivers in the place of the appointees of Judge Jenkins. A meeting of these interests has been arranged to take place in St. Paul about Nov. 1. The man who, it is generally understood, will be agreed upon a sreceiver of the large interests involved is Mr. Robert M. Gallaway, President of the Merchants' National Bank, of New York, who has had a long railroad experience, partly as Vice-President of the Manhattan Railway,

Notes on Foreign Railroad Practice.

At the September meeting of the Western Railway Club Professor W. H. Warren, of the University of Sydney, New South Wales, in speaking of Australian railway affairs, said:

The conditions which govern railway work in Australia I imagine to be similar to those which existed in this country in the early days of railroad engineering. Railroad engineering in Australia, more especially in New South Wales, is largely influenced by American practice. We have, I think, a somewhat better track than I have yet seen. (As I say, I have only come as far as Chicago.) For example, we have the standard 80-pound rail on very excellent timber, known as iron bar, which grows very plentifully in Australia, particularly in New South Wales. These sleepers are placed about 2 feet 6 inches, ballasted with good stone ballast. Our locomotive engines present many features which are characteristic of the American locomotive. In regard to our rolling stock, we have sleeping cars for long journeys and ordinary American cars for suburban traffic. In signaling, our double lines, mostly suburban, are worked on the absolute block system, similar to English railways. Our single lines, which extend through the country, are worked on the electric staff system. Our passenger stock is fitted with the Westing house brake, and our freight cars will very soon be fitted w ith the quick acting Westinghouse freight brake.

Mr. Clement F. Street, who recently returned from a trip around the world as engineer of the Transportation Commission of the Field Columbian Museum, spoke of the impressions gained by his study of the railroads in various countries, and said:

The Egyptian railways are probably fully as good as any we saw in any of our travels. This was a matter of great surprise to me as it is to nearly everyone who visits Egypt, for some 12 years ago all the railways in that country were characterized as scrap heaps, which I guess was a very good name for them. But since the English occupation there has been a wonderful change in the railways, under a management consisting of a board of three members, an Englishman, a Frenchman and a native Egyptian. The railways are owned by the Government, and the Board of Directors is responsible to the stockholders for the money invested. The Englishman prevents the Frenchman from buying any material in France; the Frenchman prevents the Englishman from buying anything in England, and the consequence is that practically everything on the railways is bought in open market at a very low figure and is usually of good quality. The line extending from Cairo to Alexandria is practically level and almost straight. There are three classes of locomotives running on it, the single driver for fast express work, the eight-wheel engine for local express and the six-wheel coupled for goods. Europeans are used as drivers on express engines only. Natives are used on all the other engines, and one of the drawbacks and problems with the locomotive department, is that of satisfying the Egyptian Government by employing none but native labor on the railways, and at the same time obtaining efficient men for the service. The native Egyptian is an absolute fatalist. If the steam gets low in the boiler it is an act of Allah over which he has no control. If there are clinkers on the grate that has nothing to do with it. It is simply an act of God, something entirely beyond his power to prevent. The consequence is that the majority of engines are only hauling about one-half the load they should. I had a ride on one of the express engines with Mr. Trevethik, the locomotive superintendent, and in looking into the firebox of the locomotive the fire looked much more like a coal pile than like a fire. It was bridged over and perfectly black. The firemen had no idea of making any correction in this state of affairs.

In India the railway men have three or four very grave difficuities to contend with. One is the intense heat. I was told by several parties who were said to be perfectly reliable in all their statements, that during the hot season it was not an uncommon thing to draw water from the tank, placed in the roof of the car, into the washbasin, for the purpose of bathing your hands, and finding the water so hot that it was impossible to put even your finger in it. During the middle of the day, it is impossible for a European to go about or do any work, in the warmer parts of India. Another great difficulty is the difference in gages. They have the 5 feet 6-inch gage, the meter gage, the 2 feet 6-inch gage and a 20-inch gage. Several of the lines have two or three of these gages mixed up, and a person who has never seen the difficulties of handling the different gage cars and locomotives in one shop can have very little idea of the trouble it makes. Another great difficulty in India is the handling of the native labor. The native Indians are very expert at wood working. They are expert blacksmiths and make good molders, but no native Indian, if he can help it, will stand up to a bench. He must squat upon the ground. If he is a woodworker, he must use his feet for holding the wood, while he handles the tools with his hands. With small work this does not present any serious difficulty, but when it comes to heavy blacksmithing, the natives have found some difficulty in handling a connecting rod some 6 or 8 feet long and of considerable weight while they were squatting on the ground and using an anvil on a level therewith. This is rapidly being overcome, and the workmen are wonderfully expert. On the best railway in India, the Great Eastern, they are now running three rolling mills. The Bombay, Baroda & Central India Railway is putting in a rolling mill at Bombay. The East Indian Railway has plans made for the erection of a locomotive building shop, where they propose to turn out twenty locomotives a year. The equipment and all supplies in India at present come from England, of course.

In Siam they are building 160 miles of railway, under the direction of an English contractor. The King of Siam has 350 Europeans in his employ. The Director General of the railways is a German who has been many years in the East, and the King is paying him a handsome salary to superintend the construction of the railway. He told me that in one year, when the railway was to be turned over to the Government, he should begin at once to introduce American equipment. He asked me many questions about American locomotives and American cars, and said that he was satisfied that they were the only thing to run in a new country, and that his intention was to equip the railway throughout with American designs. In Siam there is an electric railway, built and owned by Americans, paying a handsome dividend, one of the best electric railways and one of the few which I saw.

Java is, on the map, a very small island, but there are 23,000,000 people in the island. They have something over 800 miles of railway, and within the next two years that will be more than doubled. In Java and in the Malay Peninsula there is probably more railway building than at any other point in the East, that is, excepting Japan. The island is about 600 miles long, and it takes three days to make the journey. The trains run during the day only. I don't know whether the railways are in league with the hotels, but that would be the impression.

The Japanese railways system is all built on 3 feet 6-inch gage. Most of the roads were originally built by the gov. ernment and many of them have been turned over to private companies. Most of the systems are very small. The largest has 600 miles of railway. The next largest system belongs to a private company, having some 500 miles of track. Within the next two years the railway systems of Japan will be extended greatly and the probability is that the greater part of the material will come from America.

I think that probably the most surprising thing in connection with our entire trip was the great interest shown by the people we met and the high opinion they all had of American railway systems, when compared with those of any other railways in the world, English not excepted. To a man, as far as I heard them, they say that the American railway system is the system for the Eastern countries. In India this was particularly marked. Again and again I was told by railway men in India that the engineers at home had no conception of the requirements placed upon the railways in India; that the recommendations made by the engineers in England were not in accordance with the recommendations made by the engineers in India, who were acquainted with the circumstances and conditions, and there was continual friction between the two parties. Every railway in India, practically, has a consulting engineer in London and all supplies are bought through these engineers. The engineers and locomotive men in India make recommendations which they say they cannot get carried out because they request American material. The same thing obtains in Australia and the appreciation of American methods in Australia is shown by the manner in which American equipment is being introduced, and I might say that in India, as fast as practicable, the small English type of car is being abandoned and the bogey car introduced: In India they are preparing to build their own locomotives. In Japan they are also preparing to build locomotives, and have already built one and have three more in process of construction, and the general opinion is that in a few years all the locomotives in the country will be manufactured there. The reason is obvious. A skilled machinist can be employed for about twelve and a half dollars a month of our money.

The Management and Handling of Locomotives.*

Locomotives which are not adapted to the service in which they are put cannot perform economically. That is a point to which superintendents should devote more attention. As a general condition the superintendent is not sufficiently familiar with his engines to know what their most economical performance may be, nor has he a sufficient feeling of responsibility for the economical performance of his engines. He depends too much on the mechanical officers, trusting to them to furnish engines which will do the work, and then using them as the exigencies of the service seem to require. On this point there should be a better understanding than there generally is between superintendents and their mechanical officers. The superintendent should say what he requires of his locomotives, and he should then be furnished with locomotives to fill those requirements, after which he should feel himself responsible for their economical performance.

After being supplied with locomotives designed to fill requirements as he has laid them down, it goes without saying that the Superintendent should see that such locomotives are at all times properly loaded. The economical loading of engines is a very troublesome question. True economy demands that engines should always be loaded to their full capacity, and to make time throughout the whole extent of their runs, but handle their trains with their maximum efficiency. The matter of rating them so that they shall haul neither less than they should nor be overloaded is an ideal condition which is subject to so many modifying circumstances that absolute accuracy cannot be hoped for. Nevertheless, there is room for much improvement in the loading of engines, and the application of scientific methods of rating which will enable many of us to approach much nearer than we are to the ideal condition. Experience has so far demonstrated that loading engines on a tonnage basis gives the most economical results. On the Pennsylvania lines the tonnage system of rating is giving very satisfactory results, one of the divisions showing a saving in train mileage of about one-seventh since it was adopted. On the Columbus, Hockey Valley & Toledo Railroad, in 1892, the saving was 17 per cent., the average tons per train having been increased from 506 to 593. On the Union Pacific, also, where the tonnage system has been tried, it is reported that engines make a better uniform time with a larger average tonnage than formerly, and that the plan has resulted in an increase in train haul of nearly two cars per train. In adopting the tonnage system the first thing is to establish the capacity of your engines; the next thing is to establish a method for computing loads. Knowing the dimensions, it is an easy matter to establish theoretically the maximum hauling power of a locomotive, but the figures thus reached are not always supported in practical service. There is frequent disappointment in the actual power developed; what may be the capacity of a locomotive to-day may be either more or less than its capacity to-morrow or the next day. A locomotive should not be expected to develop as much hauling capacity in severe winter weather as in summer. The condition of cars, brasses and journals in good condition and properly lubricated is also a factor to be considered. Whether we establish the hauling capacity of our locomotives, theoretically, by ordinary methods of computation, or practically, by actual tests, we thus see that the capacity is subject to constant modification, owing to contingent circumstances which are constantly varying. The only remedy for this condition is intelligence, brains, good judgment on the part of those in charge of the operating department, together with both the disposition and the privilege to use them. The superintendent cannot profitably say to his yard or trainmaster: "The capacity of such an engine is so many tons, and it must invariably be loaded up to its capacity." The maximum capacity under favorable conditions should be known, and then sufficient latitude should be permitted for reasonable deductions from such maximum in consideration of unfavorable conditions, care being taken to see that good judgment is exercised in making such deductions.

Computing the tonnage of trains is not a hard matter. It is quite true that under certain conditions of service the number of tons in a train cannot be arrived at without involving some difficulty and delay, but it is hardly conceivable that any serious obstacle should long stand in the way of arriving at the accurate tonnage of trains in transit. At stations where there are track scales it is an easy matter to show the gross weight of each car on way-bill. Yardmasters should be furnished with cards showing the weight of all loads, from which to compute the load for each engine according to its rating. At stations where there are no scales, much of the freight loaded could be weighed into cars under the direction of the agent. Where it is not practicable, owing to class of freight handled, for agents to do this, the weight of loads could be very closely estimated, which estimate would suffice until their actual weight could be ascertained. Agents could show these estimated weights on cards attached to the cars, or on way-bills. The conductor or yardmaster could then determine how many cars or tons he should take for the established rating of his engine.

Economy in the use of fuel depends to a great extent on the training and intelligence of employees. It is necessary that they should be trained to a thorough knowledge of economical methods and furnished with proper incentives to always apply such methods. Much may be accomplished by stimulating a a spirit of rivalry among employees as to who can make the best record, and establishing some system of rewards in recognition of such records. Some very satisfactory results in economical coal consumption have been attained on the Pennsylvannia lines by means of a system which seems very generally applicable. An allowance is made which is considered ample for the performance of a locomotive in a specified service. The coal thus allowed is charged to the company at a certain figure, say a $1 per ton, and on each ton saved from the allowance the fireman is credited with 25 cents, the engineer with 25 cents and the company with 50 cents. During the month of July the total premium paid to employees on one division was $1,950, the company, of course, being credited with a like amount. One crew earned $15.50 premium on coal in this month.

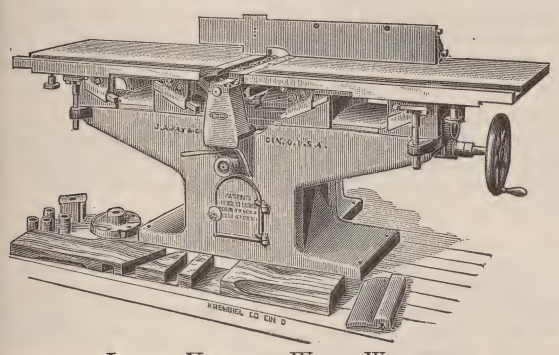
True economy demands that a locomotive should exhibit its maximum service and be worked to the limit of its full earning capacity throughout its entire life. It is not possible, of course, to arrive at this perfect requirement of economical service, but an effort should be made to approximate it as closely as possible. The first condition to such approximation are shops of sufficient capacity to meet all demands which may be made upon them for repairs, equipped with such modern tools and machinery as will enable work to be done with the highest economy. When this condition is satisfied, in many cases there should be a shifting of the standards of economy. The first consideration with many officers is to keep a locomotive out of shop as long as possible, to make it show the greatest possible number of miles run between shopping. That is one standard of economy, and much energy is devoted to that end, regardless of whether engines are performing economical service for the company and regardless of track, roadbed and structures. Miles thus attained, during which time locomotives have actually been losing money for the company, is entered as one of the factors of economy. It is needless to point out that the real interests of the company are thus frequently sacrificed in the effort to maintain a false standard of economy. It is, of course, desirable to have engines show as large a mileage between shoppings as possible, but the other highly important factors of economy should not be sacrificed to this end; the end should be conceived only within the limits of economical mileage. The factors of economy in all departments must harmonize and correspond in order that the best interests of the company may be served; they cannot conflict with each other. What is true economical practice for the company in one department must be true in all others so far as the particular item to which it relates has a bearing on the achievement of economical results in other departments. These discordant facts should be harmonized as far as possible. General results are what should be considered. Superintendents and mechanical officers must work hand in hand with a perfect understanding. In the present state of the railway business no detail of economy which promises, however slightly, to add to the net revenue derived from operation can be neglected, and your committee believes that in the matter of proper handling of machinery there are many details of economy which require closer attention from operating officers.

* Read before the American Society of Railroad Superintendents, October 14, 1895, by the Chairman of Committee on Machinery, Mr. W. F. Potter, Gen. Supt. Flint & Pere Marquette R. R.

Large Variety Wood-Worker.

This is a newly designed machine that has been suggested by the demand for a large and heavy machine capable of doing many different kinds of work on large timbers and wide material. It is made by J. A. Fay & Co., of Cincinnati, O., and it meets the requirements of car and locomotive manufacturers, not only on their heavy work, but in any light use it may be put to. It will plane out of wind, surface straight or tapering, rabbet, joint, bevel, gain, chamfer, plow, make glue-joints, square up, etc., raise panels either square, bevel, or ogee, stick beads, work circular molding, rip, crosscut, tenon, route, bore, etc.

It is furnished with one 16-inch four-side steel slotted planing head, rabbeting and jointing heads, and a 3½-inch capped molding head, and, when desired, it can be equipped with expansion grooving or paneling heads, and a boring



LARGE VARIETY WOOD WORKER.

and routing table, having vertical and lateral adjustments to suit the size of material to be worked. The tables are made of iron, each 27½ inches by 48 inches, are planed perfectly true, and have independent vertical and lateral adjustments by means of the hand-wheel at the working end of the machine. When facing and planing out of wind, the vertical and lateral adjustments can be made simultaneously, thus constantly retaining the proper distance between the periphery of cut and edge of table. All the different functions of the machine are secured by the use of two tables, thereby effecting a saving of time in making the adjustments. The tables are made with grooves to receive the gaining frame, and are made continuous by filling pieces connected with them when so used. For sawing, a short supplemental table is inserted between the other two making a continuous saw table.

The arbor is of steel, 1 11/16 inches in diameter, and revolves in three bearings supported on the column. The bearing on the front side of the machine is planed in a seat, the height of which to the center of the arbor is equal to one half the diameter of the largest head to be used. It is readily detachable for the purpose of substituting different heads. The bearings on the back of the machine are planed and gibbed in a seat, and have a lateral movement with the spindle and cutter-head for accuracy of adjustment in gaining, rabbeting, etc. This movement is accomplished by means of a small hand-wheel on the front side of the machine.

The fence requires no separate adjustment. Being attached to and forming a part of the forward table, it always maintains its proper position in relation to the knives. It is adjustable across the table, is fitted to receive pressure springs for holding down the material, and swings to different angles for beveling work. A safety guard is supplied with the machine for covering such portion of the planing head as may not be used in working narrow material.

The earnings and expenses of the Baltimore & Ohio for the three months from July 1 to Sept. 30, 1895, were: Earnings, $6,271,714; expenses, $4,207,164; net increase as compared with the same months of 1894, $10,582.

The earnings of the Chicago, Milwaukee & St. Paul for the second week in October were $836,407; for the corresponding week of 1894, $637,289; increase, $199,118. The increase for the third week amounted to $192,991.

A switch engineer was killed by his engine in the yards of the Long Island Railroad, at Long Island City, Oct. 17. He crawled beneath the tender without notifying his fireman, and the latter receiving a signal to move the engine did so with fatal results to the engineer.

A lease has practically been effected by the Atlantic Coast Railway Company, of the Asbury Park and Belmar (N. J.) line. This, if completed, will make a continuous trolley route from Pleasure Bay to Belmar. It is proposed next spring to extend the system as far south as Point Pleasant and North to the Atlantic Highlands, about 50 miles.

According to *Engineering* an ingenious method of welding lead has been recently devised by M. Blondel. The surfaces to be joined are carefully cleaned, and between them is placed a thin layer of lead amalgam. On passing an ordinary soldering iron along the line of junction, the mercury of the amalgam is vaporized, and the lead, set free in an exceedingly finely divided state, fuses and unites the two surfaces together.

The case of a block of Oregon pine taken from the middle of an upright which formed a part of the timber support in the Comstock mines for twelve years gives an example of the effect of heavy pressure on wood fiber. It is so hard that it cannot be cut with a knife, and one of its sides is polished from the friction it has undergone. Yellow pine from the lower levels of the Comstock has been so compressed by the enormous weight that its density exceeds that of *lignum vitæ*.

A collection of Colonial relics for the ladies' exhibit at the Atlanta Exposition is being made, and one recently secured is a curiosity in its way, and seems to be proof positive that George Washington was somewhat of a stock-grower, and took a hand in making exhibits at fairs himself. It is a large solid silver cup, with the date 1790 upon it. It bears the following inscription just under the rim: "A premium from the Agricultural Society of South Carolina, to General Washington for raising the largest jackass." Just under the word "jackass" is a picture of the animal himself engraved on the silver.

Losses Through Strikes.

The annual report of the United States Commissioner of Labor, Col. Carroll D. Wright, was made public Oct. 20, and shows that during the last seven and a half years Illinois had the largest number of establishments affected both by strikes and lockouts, there having been 10,060 of the former and 1,193 of the latter. New York came second on the list, with 9,540 establishments involved in strikes and 723 in lockouts, and Pennsylvania third, with 8,219 strikes and 490 lockouts.

The industries most affected by strikes during the years named were the building trades with 20,785 establishments involved, coal and coke with 5,958, clothing with 3,041, tobacco with 2,506, food preparations with 2,398, stone quarries and cutting with 1,993, metals and metallic goods with 1,834, transportation with 1,327, printing and publishing with 608; while those most affected by lockouts were the building trades with 1,900, stone quarrying and cutting with 489, clothing with 431, brewing with 150, metals and metallic goods with 128, and transportation with 112 establishments involved. The total number of employees involved or thrown out of employment during this time was 2,391,208.

About 70 per cent. of the strikes and lockouts occurred in the following five States: Illinois, Massachusetts, New York, Ohio and Pennsylvania, while the lockouts in these States were about 76 per cent. of all those throughout the country. The report shows that these five States contained 51 per cent. of all the manufacturing establishments and employed 56 per cent. of the capital invested in the mechanical industries of the country, taking the census of 1890 as the basis of computation.

In New York City the wage loss of employees was nearly $6,500,000, exclusive of $792,000 contributed to them by other labor organizations, while the loss of employers was a little more than $3,500,000. The number of strikes in Boston was 257, with a loss to the employees of $800,000, as against $589,000 for the employers. The total number of strikes in Allegheny and Pittsburg was 251, but the loss of wages was $7,379,765, while the loss to employers was $2,600,000. In Chicago, where the strikes aggregated 528, the loss to employees reached nearly $9,000,000, while that of the employers was nearly $14,500,000, In Paterson, N. J., where the number of strikes was only 47, the loss to employees was more than $1,000,000, as against half that sum for the employers. The total wage loss to the employees in 26 leading manufacturing cities was in round numbers $35,000,000, while the loss to employers was something less than $29,000,000.

The number of lockouts as compared with the strikes for the same period was small in the aggregate, but the losses incurred were enormously increased. The total was 244 lockouts, with a loss of wages to the employees of $12,000,000, while the loss of employers was nearly half that sum

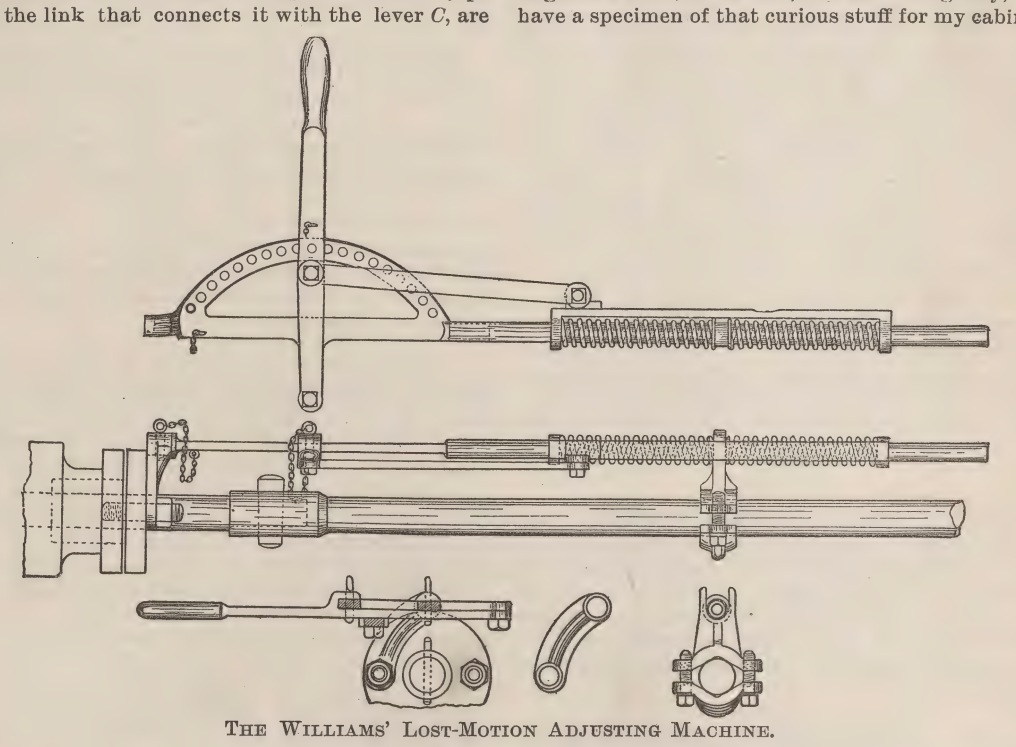
For the period covered by the report, out of the 46,863 establishments affected by strikes, success in their demands was gained by the employees in 30,397; partial success was gained in 4,775 establishments, and failure followed in 21,687 establishments. Out of the 3,853 establishments having lockouts, 1,883 succeeded in gaining their demands; 391 partially succeeded, and 1,558 failed.

The leading cause of strikes was for an increase in wages, and these cases represent 25 per cent. of the whole number. Thirteen per cent. were for reduction of hours; 8 per cent. were against reduction of wages; 7 per cent. were sympathetic; 6 per cent were for increase of wages and reduction of hours; 4 per cent. were against employment of non-union men, and 3 per cent. for a recognition of the union.

A Valve Setting Device.

The Q. and C. Company has placed on the market the device illustrated herewith for artificially taking up the lost motion in the valve gear while valves are being set, thus duplicating the conditions existing when there is a steam pressure on the valves, and facilitating accurate adjustment.

The lever *C*, segment *A*, arm *B* and clamp *G* are made of malleable iron; the barrel over which the springs slide is made of ⅞-inch steel. The bar through which the pipe passes, and the link that connects it with the lever *C*, are



THE WILLIAMS' LOST-MOTION ADJUSTING MACHINE.

malleable iron. The springs are made of No. 6 spring steel wire, wound two to the inch, and tempered so they will stand to be compressed solid together, and come back to the original length. There are two each of arms *B* and clamp *G* with each machine. Arms *B* are right and left; but clamps *G* are both made from the same pattern.

In use, attachment is made as shown in Figures 2 and 3, which represent the left side of locomotive. After attaching arms *B* and clamps *G* to both sides, the machine can be used on both sides of engine.

Fan System of Knoxville Shops, Southern Railway.

The Buffalo Forge Company, of Buffalo, is now supplying several carloads of fans, engines and heaters for the heating and ventilating of the new shops of the Southern Railway Company, at Knoxville, Tenn., now in course of erection. All of the buildings of these shops are equipped with the Buffalo fan system. There are used at Knoxville six fans, three 130-inch, two 140-inch and one 80-inch size, which have a total combined capacity of delivering 466,960 cubic feet of air per minute at 1 ounce pressure. The amount of lineal feet of pipe if strung out on one continuous length would be six miles. The large fans are in the main equipped with double direct connected engines entirely enclosed to keep the dust from the working parts, which type represents the highest refinement in the matter of dust enclosure, smooth running and economy. The Buffalo Forge Company also has received contracts for heating the Southern Railway Company's shops at Atlanta, Ga.

A Tale With a Moral.

The following story is told of five merry maidens who decided to have their pictures taken by a traveling photographer *a la* cherub: The artistic accessories of the establishment were limited and the camera manipulator was short of clouds. But he was a man of infinite resources and he promptly improvised the ethereal background by cutting a slit in a large newspaper. Through the hole in the paper each of the five pretty heads was thrust to be snapped at by the camera. When the developing process was completed a horrible discovery was made. The newspaper page had contained a mammoth advertisement of ready-made clothing, and there beneath each cherubic countenance was the line in large display type: "All our pants are double lined."

Moral: A good advertisement never sleeps.

The Cleveland Twist Drill Company want us to say to their patrons: "Don't miss seeing our Big Drill, Section H, Column Nos. 45-6, Cotton States and International Exposition, Atlanta."

The Prentiss Vise Company, of 44 Barclay street, New York, has issued a new illustrated price list of the favorably known Prentiss vises, several new styles of which have been perfected lately.

The Joseph Dixon Crucible Company, of Jersey City, has issued a pamphlet containing a number of testimonials from locomotive engineers stating the excellent lubricating results obtained by the use of pure flake graphite made by this company.

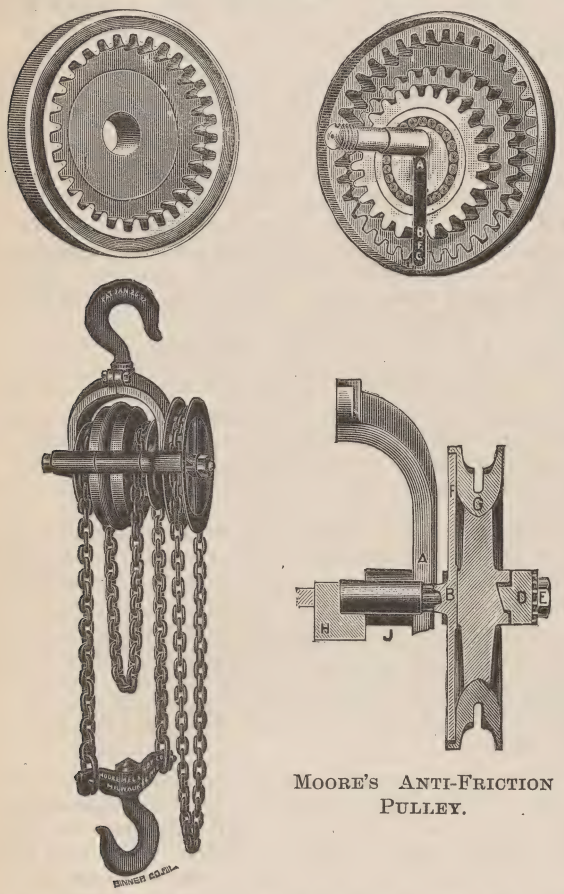
Pearson's Weekly tells the following as a true telephone story: "A large firm in Aberdeen recently engaged as office boy a raw country youth. It was part of his duties to attend to the telephone in his master's absence. When first called upon to answer the bell, in reply to the usual query, 'Are you there?' he nodded assent. Again the question came, and still again, and each time the boy gave an answering nod. When the question came for the fourth time, however, the boy, losing his temper, roared through the telephone: 'Man, a' ye blin'? I've been noddin' me heid aff for t' last hauf oor.'"

A meek-looking stranger, with a distinctly ministerial air, applied for permission to look over a large rubber factory. He knew nothing at all about the rubber business, he said, and, after a little hesitation, he was admitted. The superintendent showed him about in person, and the man's questions and comments seemed to come from the densest ignorance. Finally, when the grinding-room was reached, he lingered a little, and asked, in a hesitating way, "Couldn't I have a specimen of that curious stuff for my cabinet?" "Certainly," replied the superintendent, although it was a compound the secret of which was worth thousands of dollars; "certainly, cut off as much as you wish." With eager step the visitor approached the roll of gum, took out his knife, wet the blade in his mouth and—— "Stop right where you are!" said the superintendent, laying a heavy hand upon the stranger, "you are a fraud and a thief. You didn't learn in a pulpit that a dry knife won't cut rubber." So saying, he showed the impostor to the door, and the secret was still safe.—*India Rubber World.*

Moore's Anti-Friction Pulley.

The accompanying illustrations show the construction and action of Moore's anti-friction differential chain pulley block, made by the Moore Manufacturing and Foundry Company, of Milwaukee, Wis. It has several points of excellence, the chief of which claimed by the makers is that it is a perpetual lever, always working at its most advantageous point.

The pinion is double. The line *A*, *B* and *C* is the lever. The fulcrum is an imaginary point *F* on the line of the lever midway between the pitch lines of the small and large pinions. The annulars, or internal gears, are in mesh with the two pinions at points *B* and *C* on the above named lever. The lever operates on the annulars at these points; and, since the lift chain hangs from opposite sides of these annular wheels, they are pulling in opposite directions, one on each side of the imaginary fulcrum *F*. It will readily be seen that, whatever the position of the eccentric and pinion, the relative position of this imaginary line, or lever, is always the same. It is rather an infinite series of levers, corresponding in number with the number of points on the pitch line of the annular wheels. It is apparent that the load on the block exerts through this leverage a constant pressure on



MOORE'S ANTI-FRICTION PULLEY.

the side of the eccentric, and that the block will "run down" unless there is sufficient friction to prevent it.

A friction plate *F*, of slightly less diameter than the hand wheel, is mounted upon an extension of the hub of the hand wheel and between it and the block frame *A*. The friction plate has a wedging contact with the block frame at *B*, and the hand wheel has a reverse wedging contact with the clutch *D*, which is keyed to the shaft and held in position by the adjusting nut *E*. A pull on the hand chain to raise the load loosens the wedge *B* and tightens the wedge *D*, while a pull on the hand chain to lower the load tightens the wedge *B*, but loosens the wedge *D*, one wedge counteracting the other and producing no friction between the plate and the friction surface of the wheel at the point *F*. But when the hand wheel, *G*, is in a state of nertia, the pull of the load on the shaft tightens the wedge *D*, carrying with it the hand wheel and friction plate, tightening also the wedge *B*, and the two wedges acting together set the frictional surfaces into contact and effectually lock the block. A pull on the hand chain in either direction releases one of the wedges, but as soon as the pull ceases the load instantly catches up and locks both of them. The lock is positive and smooth working since the friction surfaces are really never out of contact, and heavy loads may be lowered by a pull on the chain of a very few pounds.

LOCOMOTOR ATAXIA.—Curate—So sorry to hear your husband's met with an accident, Mrs. Snape. Mrs. Snape—Yes, sir, 'e's very bad, pore man! 'E wur workin' on the railway line th' other day, an' a engine come along an' run clean over 'is pore leg; an' now 'e'll be laid up abed for weeks. It's what I b'lieve the doctor calls locomotive attacks ye!—*Punch.*

Some new and very beautiful designs in ornamental glass, cut and embossed glass, are produced by the Messrs. Schaefer Brothers, of 94 South Fifth avenue, New York. These should be of special interest to car builders. A pamphlet issued by this firm contains nearly 700 beautiful designs, and another and enlarged pamphlet is in course of preparation. The firm has unequaled facilities for furnishing new styles and promptly filling orders.

Apropos of railway racing, a French paper tells the following story of meridianal exaggeration: An Englishman and a Marseillais were disputing which was the faster train, the express to Edinburgh or the "rapide" to Marseilles. The Southerner finally clinched the matter with the following anecdote: "Look here," he said, "the 'rapide' is the fastest train in the world, and here's the proof of it: The other day I was getting on board at Paris when the station-master said something that annoyed me. My blood was up, I aimed a blow at him, when the train suddenly started and it was the station-master at Avignon who had his ears boxed."

To Encourage Co-operation.

The Brooklyn Heights Street Railway Company has adopted a new plan of securing more careful work by its employes. It has set aside $10,000 to be divided among its conductors and motormen who avoid damage to persons and property. The following is a part of the order establishing the new conditions:

"All conductors and motormen in service this date and who, between now and May 1, 1896, shall have had no accident causing either injury or damage to other persons or property, or to the company's property, and who have not been suspended for violation of the company's rules, will receive on that date a pro rata share of the above sum.

"The management desires to impress upon the employes that the success and prosperity of the company depend upon safe, regular and quick car service, together with courteous treatment of the public by its employes, and the payment of this amount is authorized in the hope of securing more efficient and conscientious service on the part of both conductors and motormen and thus improving the service of the company's lines."

The Cleveland Twist Drill Company announces that on Oct. 15 it was granted a patent on its well known "grip socket," which has been illustrated and described in these columns. This settles the question of this company's exclusive right to make and sell these valuable tools.

The Atchison, Topeka & Santa Fe Railroad is equipping 25 passenger cars with Pintsch lights, which will be used in the through trains from Chicago to the coast. It is the intention of the Atchison company to apply the Pintsch light to all of its cars as fast as circumstances will permit.

That railroad companies are not slow to avail themselves of any improvement in this line, is shown by the report of the sales of several large air compressors, by the Clayton Air Compressor Works, Havemeyer Building, New York, to be used for supplying air in a wide variety of shop purposes.

Messrs. Bryan & McKibbin, dealers in railway, steamship and contractors' supplies, with offices at 120 Broadway, New York, have been appointed general Eastern agents for the Sligo Rolling Mills, the A. Leschen & Sons Wire Rope Company, the Oriel Lumber Company and the Buckeye M. I. & C. Company's "Little Giant" Coupler.

The Ajax Metal Company, of Philadelphia, has issued a folder that shows good pictures of some famous locomotives and steamships, the New York Central engine, 999, the new fast locomotive on the Philadelphia & Reading, and the steamship *St. Louis*. The reader is informed in red ink that these world beaters are equipped throughout with Ajax metal bearings.

The Jones & Lamson Machine Company, of Springfield, Vt., has published a handsomely printed and illustrated book of 80 pages, entitled "Rapid Lathe Work," and devoted to describing the Hartness flat turret lathes, and work done on the same; also describing special lathe tools manufactured by this company, calculated to reduce the cost and improve the output of lathe work.

The window display made by a Glasgow newspaper in connection with the recent yacht races included a dial to indicate American time. "That clock's clean wrong," said a man, as he pushed his way into the thick of the enormous crowd that had assembled. "It's a gweed five hours ahint." "Hoot, min!" answered a wag; "if they hadna pitten back the time the race wid hae been encroachin' on the Sabbath day." "Losh, freen, I never thocht o' that. Naebody can beat thae Yankees for cute dodges."—*Westminster Gazette.*

The Brady Metal Company, of New York, will remove its office on Nov. 11th to the American Surety Building, No. 100 Broadway. The company has engaged offices Nos. 18 and 19, on the fourteenth story, where they will be pleased to see their friends and patrons. In a few months the President and Sales Agent of this company, Mr. Daniel M. Brady, will have completed a quarter of a century in active railway and manufacturing service. From 1871 to February, 1883, he was connected with the New York Central & Hudson River Railroad, at the Grand Central station, and since the date mentioned he has been located at the Boreel Building, 115 Broadway, New York.

"Mannocitin" is the name of a new rust preventative made by Messrs. Edmund Muller & Mann of Berlin, Germany, and for which Mr. Otto Goetze, of 15 to 25 Whitehall street, New York, is the sole agent in this country. It is a composition of greases and oils; a few hours after application the oils evaporate, leaving a thin. slightly soft film, which adheres to the metal and absolutely protects it against all influences of the atmosphere, salt and fresh water, and against the vapors of ammonia and muriatic acid. It contains no acid, does not turn rancid, leaves no spots nor marks, but preserves the original polish of the metal. One pound covers about seventeen square yards of surface, and one coat lasts for years; hence it is very economical.

A broken frog is reported as the cause of a passenger train being ditched on the Norfolk & Western, Oct. 14. Many passengers were injured.

A company has been formed at Cairo for the construction of a line 167½ miles in length from Keneh to Assouan. The line is to have a gage of one meter and it is to be completed by Aug. 1, 1897.

A petition signed by many members of the Women's Christain Temperance Union has been sent to the several sleeping car companies urging them to stop building cars with smoking rooms in them.

The New Boston and New York Five-Hour Flyer.

The new "Air Line Limited" train, popularly known as the "five-hour flyer," made its initial trip last week, and already bids fair to become the most popular train running between Boston and New York. It is maintained jointly by the New York, New Haven & Hartford and New England railroads, and runs on week days from and to the Park Square station, Boston, leaving either metropolis at 1 p. m. and due at destination at 6 p. m.

This is a very seasonable hour for business men, and is in all respects the best arrangement that has ever been put into effect. It is essentially the long-desired Boston-New York train, and was inaugurated as such by the railroad management. Only the regular fare, $5, is charged, with the usual extra charge for parlor car seats. A buffet is attached.

The Illinois Central Railroad Company will build a new million-dollar bridge across the Illinois River at La Salle, Ill. It will be built entirely of steel. The old bridge, built in 1868, has been condemned.

Ten years ago the logs in Wisconsin ran 400 or 500 to 1,000 feet of lumber. Now 12, 15 and even 20 logs are required to furnish as much. In five years the decrease in diameter of the pine trees cut for lumber has been 35 per cent.

The Central Railroad of Georgia was sold at Savannah, Ga., Oct. 7, for $2,000,000. The sale took place in pursuance of a decree of the United States Circuit Court for the Southern District of Georgia, in the suits of the Farmers' Loan and Trust Company of New York and Alexander Brown & Sons.

An increase of $61,729 in gross earnings is shown by the statement of the Santa Fe for the month of September, all operated lines being included. The earnings for the month were $3,234,623. For the last week in September they were $1,019,112, an increase of $6,102 over those of the corresponding period last year.

A bridge gang on the Grand Rapids & Indiana Railroad pushed their car on to a siding to let the pay car pass, Oct. 18, at Ceylon, Ind., but neglected to close the switch, and the train, running 50 miles an hour, dashed into them. The pay car and the engine were wrecked, and three men were killed and several badly injured.

Rumor has it that when the Union Pacific becomes reorganized it will be a part of the Chicago & Northwestern system, and be controlled in the Vanderbilt interest, and that it is the ambition of these interests to have a direct and independent line through to San Francisco, and that to this end negotiations are in progress to secure control of the Central Pacific. This is quite improbable.

A fast freight train on the New York, New Haven & Hartford Railroad was let into a turntable pit at Blackstone Junction, R. I., recently, killing the engineer and head brakeman and seriously injuring three others. An open switch, no signals and a high rate of speed caused the accident. The engine and nine cars and the turntable were wrecked.

Our Directory

OF OFFICIAL CHANGES IN OCTOBER.

We note the following changes of officers since our last issue. Information relative to such changes is solicited.

Albany, Florida & Northern.—J. S. Crews succeeds Cecil Gabbett as General Manager.

Centralia & Chester.—R. H. Rosborough succeeds General Manager G. W. Bartlett.

Chicago, Kalamazoo & Saginaw.—J. H. Dewing succeds W. S. Dewing as Vice-President and General Manager.

Cincinnati, New Orleans & Texas Pacific.—J. P. McCuen is appointed Superintendent Motive Power. Office at Cincinnati.

Great Northern.—General Superintendent E. W. McKenna has resigned.

Interoceanic of Mexico.—G. M. Stewart is appointed Acting General Manager, vice E. W. Jackson, deceased.

Litchfield, Carrollton & Western.—T. D. Hinchliffe succeeds H. S. Carroll as General Manager.

Monongahela Connecting.—F. D. Thompson succeeds W. R. Nicholson as Master of Machinery.

Monterey & Mexican Gulf.—Arthur Monnom succeeds J. A. Robertson as General Manager. H. W. Nollan is appointed Chief of Motive Power.

Northern New York.—Master Mechanic E. La Lime is appointed Superintendent, in addition to his present duties.

Northern Pacific.—E. H. McHenry and F. L. Bigelow are appointed Receivers.

Ohio Southern.—A. S. Dunham is appointed General Manager.

Oregon Improvement Company.—General Manager C. J. Smith is appointed Receiver.

Pennsylvania.—H. D. Gordon, Master Mechanic of Juniata Shops, has resigned.

Pine Bluff & Eastern.—S. W. Fordyce, President St. Louis Southwestern, is appointed Receiver.

Plant System.—D. F. Jack is appointed Vice-President.

Rio Grande Western.—Purchasing Agent Wm. P. McElroy has resigned, and his duties are assumed by General Superintendent Welby.

Seaboard Air Line.—Office of W. T. Reed, Superintendent Motive Power, is moved to Portsmouth, Va.

Southern California.—Geo. W. Prescott, Superintendent Motive Power and Car Department, has resigned, and is, we believe, succeeded by C. F. Lape.

Southern Pacific.—J. Kruttschnitt is appointed Second Vice-President and General Manager of Atlantic and Pacific Systems. J. A. Fillmore is Manager of the Pacific System, and W. G. Van Vleck is Manager of the Atlantic System, offices in San Francisco and New Orleans, respectively. P. J. Maguire is Master Car Builder of Atlantic System, with office at Algiers, La. J. J. Ryan is Superintendent Motive Power of Atlantic System, with office at Houston, ton, Tex. J. R. Cade is Master Car Builder at Houston, Tex.

Toledo, Ann Arbor & North Michigan.—Name changed to Ann Arbor Railroad. W. R. Burt is elected President.

Wabash.—There is no change in general managership of this road yet, as generally understood. On Jan. 1, General Manager Chas. M. Hays will be succeeded by Mr. Joseph Ramsey, Jr.

Zanesville & Ohio.—Master Mechanic E. W. Jerome has resigned.

NATIONAL CAR AND LOCOMOTIVE BUILDER

DECEMBER, 1895.

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The Central of New Jersey has ordered 500 new cars.

The Illinois Central has ordered 1,000 new freight cars.

The Duluth & Iron Range has ordered 25 new box cars.

The Chicago & Alton, it is rumored, will build 100 box cars.

It is rumored that the M. D. T. Co. will build shops at Depew, N. Y.

The Chicago, Fort Madison & Des Moines has ordered 12 new box cars.

The Burlington, Cedar Rapids & Northern has ordered 100 new box cars.

The Toledo, St. Louis & Kansas City is about to purchase 500 new coal cars.

The Lehigh Valley has ordered the 2,000 box cars spoken of in our last issue.

The Gulf & Insterstate Railroad, of Texas, has ordered 200 new freight cars.

It is announced that the Lehigh Valley is about to order 25 new locomotives.

It is stated that the Union Car Works of Depew, N. Y., are running 21 hours per day.

The Toronto, Hamilton & Buffalo is in the market for a number of passenger cars.

It is rumored that the Baltimore & Ohio is in the market for a number of freight cars.

The Chesapeake & Ohio has ordered 100 new plain bottom coal cars of 30 tons capacity.

The Louisville, New Albany & Chicago is said to intend building 500 box cars this winter.

The Ann Arbor Railroad has ordered 725 new box cars, 25 of which are to be furniture cars.

The Detroit & Mackinac road will probably soon be in the market for both passenger and freight cars.

The Toledo & Ohio Central has ordered 200 new box cars. The Tower coupler was specified on these cars.

The International & Great Northern is running its car shops at Palestine, Tex., on new car work entirely.

The Baltimore & Ohio Southwestern is said to be in the market for 1,000 cars, divided between box and coal cars.

The Standard Oil Co. has begun to equip about 4,000 cars of the Union Tank Line with the Westinghouse air brake.

The Pennsylvania Railroad is fitting up at Altoona a locomotive with the Holden apparatus for burning liquid fuel.

The Northern Pacific road has put into service a number of grain cars 37 feet long, and with a capacity for 70,000 pounds.

A passenger train on the Auburn division of the Lehigh Valley Railroad ran into a landslide Nov. 11, killing the engineer.

The Norfolk & Western has ordered 600 new box cars for immediate delivery. The Lenoir Car Company will build 100 of these.

The Michigan Central has awarded a contract for a big transfer grain elevator in Chicago that will have a daily capacity of 150 cars.

The Carlisle Manufacturing Company has received a contract for the construction of 200 freight cars at its works at Carlisle, Pa.

The New York, Chicago & St. Louis has ordered 500 cars. Three hundred will be box cars and the remaining 200 will be rail cars.

The Chicago, Milwaukee & St. Paul is to build 800 new freight cars, nearly all of them at the shops of the company in West Milwaukee.

The Kings County Elevated Railroad, of Brooklyn, N. Y., will restore on January 1 the 10 per cent. which was taken off the employees' wages two years ago.

The Ohio River road has placed an order with the Brooks Locomotive Works, of Dunkirk, N. Y., for two freight locomotives to be delivered as soon as possible.

It is stated that the Rio Grande Western Railroad Company intends extending the road to Los Angeles, and that work will be begun on the extension in the spring.

St. Paul will hold a winter carnival without any ice palace. The St. Paul people have no fear of a scarcity of ice, but they doubt its utility as a climate boomer.

The Kansas City, Pittsburgh & Gulf has ordered 300 box, 100 coal and 50 platform cars. The Chicago Car Roofing Company's roof was specified on the box cars.

An engineer on the New Jersey & New York Railroad was much surprised recently to find a live eel stopping up the strainer of his tank hose. Mr. Eel was served for supper.

The erecting department of the Chesapeake & Ohio shops at Huntington, W. Va., which was recently destroyed by fire, will be rebuilt at once. This department employs about 400 men.

The second of the three electric locomotives ordered of the General Electric Company by the Baltimore & Ohio Railroad was shipped from the company's works at Schenectady, Nov. 13.

A misplaced switch caused a wreck of a stock train on the Louisville & Nashville Railroad Nov. 8. One man was killed, as were also 150 head of cattle and 20 hogs. Twelve cars were destroyed.

The recent drought in the West has caused the water in the Great Lakes to fall to the lowest point within memory, involving serious delays in shipping and losses aggregating a large sum to shippers.

The boiler of a locomotive on the Lehigh & Hudson Railroad exploded Nov. 9, near Belvidere, N. J., killing the engineer and the train conductor, and seriously injuring the fireman and a brakeman.

The Pennsylvania Railroad has ordered 400 new freight cars from an outside builder. This road will shortly order about 50 new day passenger coaches for use on the Pittsburgh, Cincinnati, Chicago & St. Louis road.

The *American Agriculturist* estimates the apple crop of the United States for 1895 at 66,256,000 barrels, as against 57,629,000 barrels in the previous year. The increase was largest in Ohio, Indiana, Illinois and Missouri.

The Pennsylvania Railroad has ordered so far this year 5,500 new freight cars, 4,000 of which are for the lines west of Pittsburgh. Of these 1,500 were drop bottom gondola cars; 2,000 hopper bottom ore and coal cars, and 2,000 box cars.

On the evening of Nov. 16 a street car in Cleveland was run through an open draw into the Cuyahoga River, resulting in the death by drowning or otherwise of 18 people. All but one of the passengers in the car perished.

The Southern Railway Company has contracted with the Cramps Shipbuilding Works for a steel passenger steam ship to ply between Norfolk and Baltimore. The new vessel will be 242 ft. long and 42 ft. beam and will have accommodations for a hundred passengers.

As showing that the matter of half rates to clergymen is of some importance to the railroads, it is stated that the Western Passenger Association has issued 75,000 clergy permits this year to missionaries, traveling ministers and the floating element of the clergy in general.

The *Railway World*, of Philadelphia, informs us that, beginning with its issue of Nov. 30, the first of a series of articles by W. Hasell Wilson, C. E., entitled the "Reminiscences of a Railroad Engineer," will be begun. These articles will appear weekly for about eight weeks.

One of the street railway mail cars (illustrated and described in our last issue), in service on the Third avenue cable line in New York, was burned while making a trip on the evening of Nov. 3. When the car was found to be on fire it had discharged most of its contents, but the remaining mail matter was saved.

A broken flange is reported as the cause of a wreck on the Baltimore & Ohio Railroad, Nov. 3, by which two persons were killed and about 25 others injured. A broken rail is stated as the cause of a similar wreck on the Missouri, Kansas & Texas the same day, in which the engineer was killed, four coaches wrecked, and about 20 passengers injured.

A notable run was made Nov. 10 on the Chicago, Burlington & Quincy by a passenger train which covered the 80 miles between Galesburg and Mendota, Ill., in 80 minutes, including stops. Supt. Rice estimates that two stops and five slow-ups caused a loss of 20 minutes. This makes the actual running time 60 minutes, or at the rate of 80 miles an hour.

The New York & Sea Beach Railroad Company, on whose tracks occurred the serious collision of Sept. 2, killing or injuring 60 passengers, has been notified of lawsuits for damages aggregating nearly $1,100,000. The company has a capital of only $500,000, and has gross earnings of only $85,000 a year, and it has not yet settled any of the claims growing out of this collision.

Mr. S. Fujita, Assistant Locomotive Superintendent of the Nipon Railway of Japan, is now in this country making a tour of the various shops and supply houses with a view to becoming better acquainted with American methods of railroading. He is also making a close examination of the different kinds of locomotives and mechanical appliances in the interest of the company he represents.

One of the curiosities of the cable code method of sending information is shown in a recent message announcing the loss by fire of a ship at sea. The whole message was conveyed in three words of Scott's cable code. "Smouldered, hurrah! hallelujah!" "Smouldered" stands for "the ship has been destroyed by fire"; "hurrah" for "crew saved by boats," and "hallelujah" for "all hands saved."

The Illinois Central has purchased the St. Louis and Belleville Railroad for $500,000. The road runs from Belleville, Ill., to East St. Louis, fourteen miles. It runs through a good coal region, and it is thought the Illinois Central proposes to extend it to some point on its main line near Tamoronthus, securing an independent outlet to St. Louis. At present the Illinois Central depends upon the Vandalia and Cairo Short Line for an outlet to St. Louis.

Articles of consolidation of the St. Louis, Siloam & Southern Railway Company have been filed. The new company proposes to build and operate a standard gage road from St. Louis to Fort Smith, Ark., a distance of about 300 miles. The capital stock is $8,000,000. The officers are: H. D. Mackey, President; Willian Fishback, First Vice-President; T. J. Portis, Second Vice-President; F. G. Portis, Secretary, and W. J. Kregbill, Treasurer.

The New England Railroad became a part of the New York, New Haven & Hartford system on Nov. 14, when a meeting of stockholders and directors of the New England Company was held in New York, and elected President Charles P. Clark, of the New Haven Company, President. General Manager J. T. Odell was re-elected. It was announced by President Clark that there would be no changes in the permanent operating officials of the road.

A statement of the earnings of the Chicago, Milwaukee & St. Paul road for the month of October says that these were something phenomenal and unexpected, reaching nearly $4,000,000, an amount that has not been touched by the road in any one month since the great year of 1892, when it could not haul all the freight offered. During last September the earnings were something over $3,000,000, which was looked upon as a most satisfactory and somewhat unexpected showing.

Rumor has it that the Chicago, Burlington & Quincy is quietly moving to secure control of the Northern Pacific. The story is to the effect that the Burlington would not be unwilling to take entire possession of the road, or form a close traffic contract with it, such as is now in effect between the Chicago & Northwestern and Union Pacific, and, perhaps, even guarantee interest on its bonds or a fixed amount of net earnings per annum. Burlington officials profess to know nothing about this matter.

The French Minister of Public Works has published in the *Journal Officiel* the statistics relative to the French railroads during the first six months of the year, as compared with the same period in 1894. On June 30, 1895, the total length of the railways was 36,425 kilometers, which represent an increase of only 311 kilometers over the figures on June 30, 1894. The receipts during the first half of 1895 amounted to 569,680,000 francs, or an increase of 5,717,000 francs over those of the same period in 1894.

The sixth annual report of the Great Northern Railway Company for the year ending June 30, 1895, shows that general conditions along the line are better than most people supposed. The gross earnings of the entire Great Northern system aggregate $13,109,930, of which $10,365,031 was from freight and $1,854,821 from passenger business. This was an increase of nearly $2,000,000 over the previous year. Operating expenses were $7,146,462 and net earnings $5,953,477. The increase in net earnings was $1,106,899.

According to the annual report of the Manhattan Elevated Railway, the total number of passengers carried by it during the last year was 188,072,645, against 196,159,323 in 1894, a decrease of 8,086,678 passengers. The decreased number of passengers carried by the road for the year is generally attributed to the competition of the Metropolitan Traction Company, whose cable lines are doing an enormous traffic. The brilliant lighting of the Metropolitan cars by Pintsch gas is undoubtedly one of the elements in the question.

The Chicago & Alton management has announced that on Jan. 1 a rigid system of eye inspection will be introduced in the transportation department of the road. All the men in the department will have to submit to an examination at least once a year. As compared with normal vision or 100, the test must show a range of vision for both eyes of 6.8. Vision normal in one eye and in the other absent, or not more than 6.6 unfits for service. Defects of vision corrected by lenses will not be permissible, but defects due to age may be thus corrected. Total color blindness unfits for the service. The excessive use of tobacco under certain circumstances will be sufficient cause for rejection of employees.

New Postal Car, Baltimore & Ohio Railroad.

About two years ago the NATIONAL CAR AND LOCOMOTIVE BUILDER called attention to the uselessness of end platforms on mail, baggage and express cars. It was pointed out that the principal use of platforms on such cars was as a base of operations for highwaymen, and that the abolition of platforms would largely decrease the chances of telescoping and mitigate its severity, as the space between the end of a car platform and the superstructure gives just so much of a clear run to the adjacent car in case of one platform mounting or breaking down another in collision; the immense impetus gained by such a start doubtless being responsible for much of the destruction resulting from accidents of this kind. At that time this paper particularly insisted on the need of dispensing with platforms on mail cars, as these are generally run next to the locomotive, the tender of which, being stronger built and narrower than the car, often telescopes it in collisions, with fatal results to mail clerks. These statements received the attention of the postal authorities at Washington, and the result is that the Postal Department is insisting on our recommendations being carried out, and among other improvements made in the construction of new postal cars is the abolition of end platforms.

The first of such new cars to go into service are four on the Baltimore & Ohio Railroad to carry the through mail between New York and St. Louis. This service was begun Oct. 20th, and through the courtesy of Mr. E. W. Grieves, Superintendent of Car Department of the Baltimore & Ohio Railroad, we are enabled to present herewith engravings of drawings showing the general construction and general appearance of these cars, as well as the arrangement of the interior.

The car is 62 feet 8 inches long over the end sills, and 63 feet 11 inches long over the couplers. The inside length is 60 feet, and the inside width 9 foot 1 inch. The side, intermediate and center sills are of yellow pine, of the dimensions given in the views of these on this page. The side-sills are composed of two 4-inch by 8-inch timbers bolted together, and these are reinforced by a plate of iron ½-inch thick and 7 inches deep, extending 18 feet back from the end sills between the two timbers. The inner piece is gained ½-inch deep to receive this plate. The inner half of the side sill is let into the end sill with 1⅜-inch by 1½-inch double tenons, while the outer half is gained 2 inches deep at the end to receive the end sill, and is beveled at the corner corresponding to the angle of the end sill. The center sills are reduced to 4⅜ inches by 8 inches, between bolsters, and plated on the outside with ½-inch by 7-inch by 18-foot iron plates bent around to form an angle against the end sill. The center and intermediate sills are let into the end sills with 1⅜-inch by 1½-inch double tenons.

The bridging between sills is made of 1¾ inch by 8 inch pieces secured to the sills by double tenons, except at the body bolsters, where the bridging is 6 inches by 8 inches. The under frame is securely tied together with ⅝-inch tie rods as shown in the plan of the same on this page. The end sills are 8 inches by 8 inches white oak secured to the side sills with ¾-inch by 7 inches wrought iron knees placed inside, and bolted with ¾-inch bolts. They are strengthened with ¾-inch by 6 inches by 6 inches angle irons gained flush into the face of the end sills and ¼ inch deep into the bottom. The sub-sills are of white oak 7 inches by 12 inches at the center, and 7 inches by 6½ inches at the ends, bolted to the end sills, the bottom being flush with the bottom of the angle iron on the end sill. They are faced with a ⅜-inch iron plate. The needle beams are 4½ inches by 8 inches, those at the center being trussed with ⅝-inch iron rods, and those toward the ends not trussed. All are bolted to the sills, and have cast-iron caps on the ends.

There are four body bolsters, two at each end spaced 2 feet 5 inches on each side of the center plate. They are formed of two plates of iron, the upper plate being 1¼ inches by 8 inches, and the lower 1½ inches by 8 inches. These are bolted to the sills.

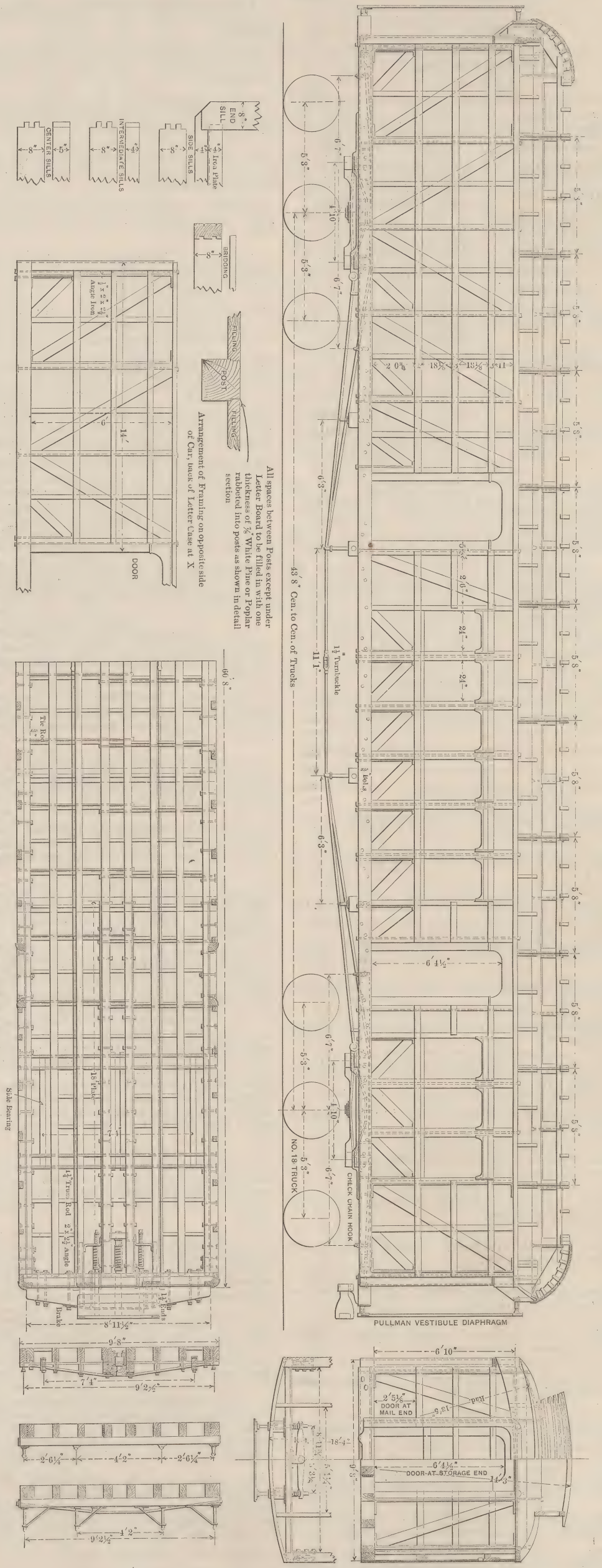
The body side bearings are double and made of ¾-inch by 3-inch iron bars, their ends bolted to the body bolsters, and the bars separated by cast-iron thimbles. Steel friction plates ⅜ inch by 3 inches are bolted to the bottom to bear against the truck side bearings. The side and end body posts are of yellow pine let into the sills and plates with tenons. The first and third side posts at each end are reinforced with ½-inch by 2-inch by 2-inch angle irons, flanged to form angles against the sills and plates. The corner and door posts are of poplar fastened to body posts with 3½ inches in countersunk screws.

The flooring is of yellow pine laid in two courses with boards 1 1/16 inches thick, the lower course being laid diagonally, and the upper course longitudinally. Three courses of ⅞-inch white pine is fitted between the sills to form a deafening floor. Also the spaces between the side and end posts are similarly filled with white pine ⅞ inches thick fitted into rabbets in the posts. The sheathing is of poplar, tongued and grooved, ¾ inches thick. Mahogany ¾ inches thick is employed for the deck and window sashes. The car has but one door for entrance and exit, this being at the storage end. At the distribution end there is a small door 2 feet 5⅛ inches high, and opening under the letter case.

The plan of the interior arrangement is so plainly shown

NEW PLATFORMLESS POSTAL CAR, BALTIMORE & OHIO RAILROAD.

Designed by Mr. E. W. Grieves, Superintendent Car Department.



on this page that a description is unnecessary. The letter cases are made of ash and have brass wire bottoms to the pigeon holes. The distribution table at the letter cases is cherry, 17 inches wide all round. The distribution table at the sack racks is also cherry, 26 inches wide and made in two parts, the outer part 14 inches wide turning back over the stationary part. The storage poles are ash, 2½ inches in diameter, set in cast-iron sockets. Illumination is provided by Pintsch gas, with 8 lamps per car, the storage capacity being sufficient to keep all these burning 45 hours. Eight oil lamps are also provided for possible use. The Gold system of steam heating is employed in connection with Baker heaters.

The car is carried on two six-wheel trucks, of the swing bolster type, with 33-inch steel tired wheels. Steel axles are used with journals 4½ inches by 8 inches. The car has vestibule diaphragm plates without the rubber diaphragms. The Westinghouse automatic brakes with 14-inch cylinders and quick action triple valves are used. The hand brake wheel is placed against the end of the car, as shown, five feet above the sub-sill, and has a chain passing down through a hole in the sub-sill and over a sheave to connect with a pull rod.

Adoption of the Joint Traffic Agreement.

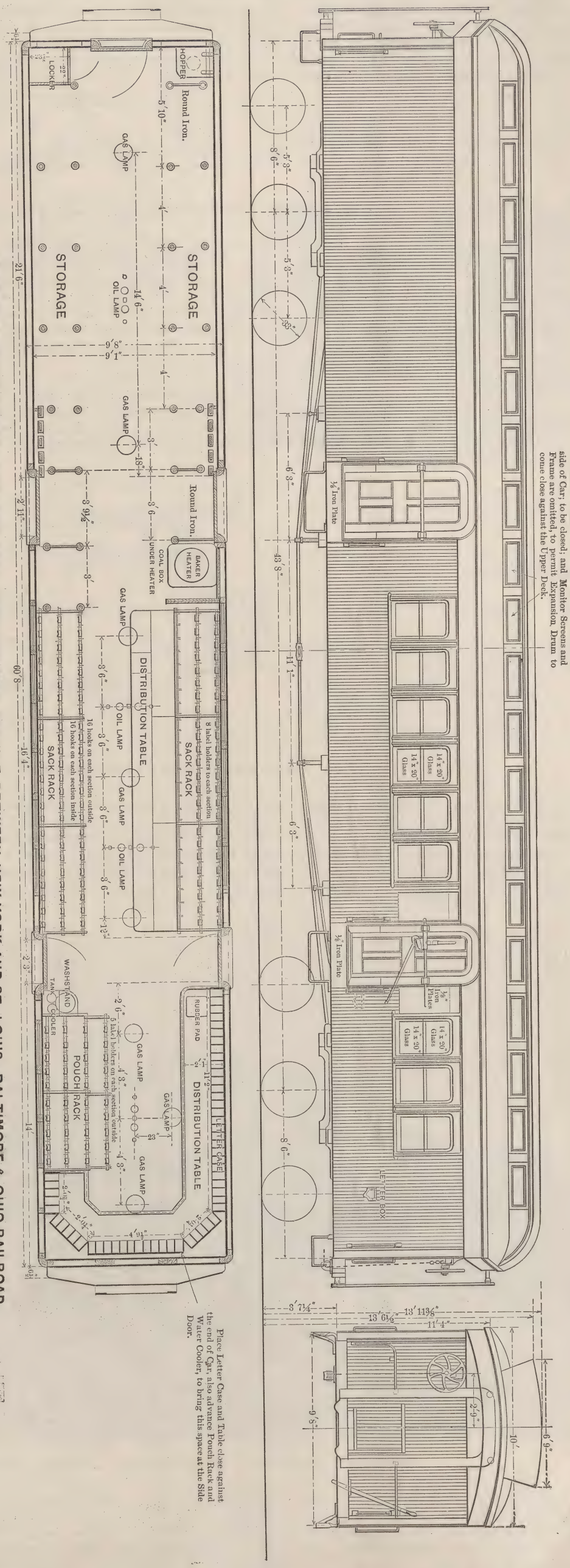
The presidents of all the lines represented in the Trunk Line Association met in New York City on Nov. 19, and unanimously adopted the articles of organization of the Joint Traffic Association, and agreed to make them effective Jan. 1, 1896. This is the most important and carefully matured railroad agreement ever entered into in this country. It has been the result of months of study and debate. It is believed that the agreement not only covers all the conditions of the railroad problem in the vast territory of the trunk lines and their Western connections, but also conforms to the laws of the United States and of the several States through which the different roads run. The presidents, after adopting the agreement, went into executive session for the purpose of appointing the arbitrators, but reached no decision. There will be another meeting Dec. 12, when the arbitrators will be selected.

The presidents authorized the giving verbatim copies of their agreement to the press, thus showing that they believe that it will stand criticism and legal opposition. Thirty railroad companies are named in the preamble as parties to the agreement, and as constituting the Joint Traffic Association. The preamble states as the purposes of the agreement the fulfillment of the Interstate Commerce act; co-operation to establish just rates, fares and rules; the prevention of unjust discrimination, the concentration of agencies and the introduction of economies. The agreement contains 21 articles, which specify the traffic included in the co-operative arrangement; provides for a Board of Control and a Board of Managers; names New York as the official home of the latter; states that application for differentials and rate changes shall be made to the managers; gives the Board of Managers power to appoint three commissioners; confirms existing rates; authorizes the organizing of joint freight and passenger agencies; provides a penalty of $5,000 for violation of the agreement, and creates a permanent Board of Arbitration, comprising three members.

The Board of Managers will be a specially important feature of the agreement, and it is provided that this shall consist of not less than nine members, of which the Baltimore & Ohio, the Chesapeake & Ohio, the Erie Railroad, the Grand Trunk, the Lackawanna, the Lehigh Valley, the Pennsylvania, the Vanderbilt system and the Wabash shall each designate one. It will require three-fourths of their entire number to adopt any proposition. The agreement is to be in force five years, but any company may retire on 90 days' notice, but must, in so doing, forfeit whatever deposits it may have made under the agreement. The Board of Directors of the different railroads must pass upon the agreement, and the signatures of their officers attached thereto, but this is now regarded as but a formality, as most of the roads have already taken official action in the affirmative.

Rating Engines According to Temperature.

Mr. S. S. Stiffey, Master Mechanic of the Columbus, Hocking Valley & Toledo Railway, has reduced to a system the rating of his locomotives in warm and cold weather, respectively, according to the prevailing temperature. His engines are divided into classes A, B, C and D, according to capacity and condition. Under class A the best and most powerful engines are placed, and they are graded on down in the three other classes. The difference in the hauling capacity of each class is 100 tons. A table has been prepared showing the hauling capacity of the engines of each class at certain states of temperature. When the thermometer shows that the temperature is 40 degrees, or warmer, a class A engine shall be allowed to haul 1,700 tons, and with a helper 2,200 tons. Each 10 degrees that the temperature falls the hauling capacity of that engine is decreased 100 tons, and if the temperature is between 10 and 20 degrees below zero a class A engine shall haul only 1,000 tons, or with a helper 1,400. The hauling capacity of each class is rated at 100 tons less than the next highest.



Chicago, Burlington & Quincy Fast Passenger Engine.

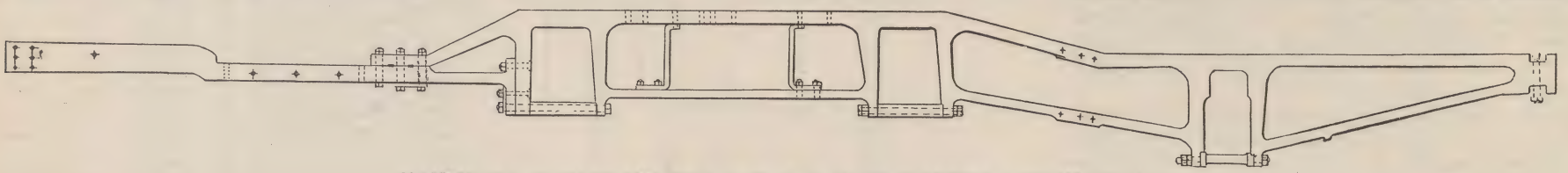
The accompanying engravings reproduce a photographic view and general arrangement, and some detail drawings showing the construction of the new fast passenger locomotive recently put in service on the Chicago, Burlington & Quincy Railroad, and built by the Baldwin Locomotive Works. The performance of this engine will be watched with unusual interest by locomotive men, as it includes a combination of features not before used together. We are indebted for our illustrative and descriptive matter to the courtesy of the builders and to Mr. Godfrey W. Rhodes, Superintendent of Motive Power of the C. B. & Q. Railroad. As will be seen in the photographic view, the general appearance of the engine is pleasing, and she has every appearance of being what she was designed for—a racer.

The engine is carried on four coupled driving wheels 84¼ inches in diameter (7 feet ¼ inch), and two trailing wheels and two leading wheels 50¼ inches in diameter. All the wheels have cast steel centers and have steel tires held on by shrinkage and retaining rings. The boiler is of the straight, radial stay type, 58¾ inches in diameter, and carries 200 pounds steam pressure. This is a simple engine with cylinders 19 inches in diameter and a piston stroke of 26 inches. Balanced piston valves are used with a maximum travel of 6 inches, $\frac{1}{32}$ inch lead in full gear and one inch inside lap. The engine weighs 138,000 pounds in working order, 86,200 pounds being carried on the drivers, 31,800 pounds on the trailers and 20,000 pounds on the engine truck. The front drivers carry 39,600 pounds and the main drivers 46,600 pounds. The total heating surface is 1,580.12 square feet, and the grate area is 44.47 square feet. The total wheel base of the engine is 51 feet. The trailing wheels have ¼ inch extra play.

The boiler is made of cast steel plates $\frac{1}{16}$ inch thick, the longitudinal seams having butt joints with double covering strips calked inside and outside. It has 210 tubes, 2 inches in diameter and 12 feet 9 inches long, of iron. The firebox is 5 feet wide, 8 feet 10⅜ inches long inside, and is 5 feet 2½ inches deep in front and 4 feet 9½ inches deep at the back. The firebox plates are of steel, ⅜ inch thick, the crown and tube sheet being ½ inch thick. The dome is placed in the center of the boiler, and is 2 feet high and 2 feet 8½ inches in diameter outside. It is attached to the boiler by means of a cast steel ring, or saddle, 1 inch thick, and its cap is formed by a ring of the same material and thickness. The firebox has a combustion chamber extending 33⅞ inches into the space usually occupied by tubes. It is equipped with a fire-brick arch. The water spaces around the firebox are 4 inches. The stay bolts used are iron, 1 inch in diameter, and all solid stay bolts and stays are drilled. The stays supporing the crown are 1⅛ inches in diameter, spaced 4 inches from center to center and screwed through the crown sheet and the roof of the boiler and riveted over.

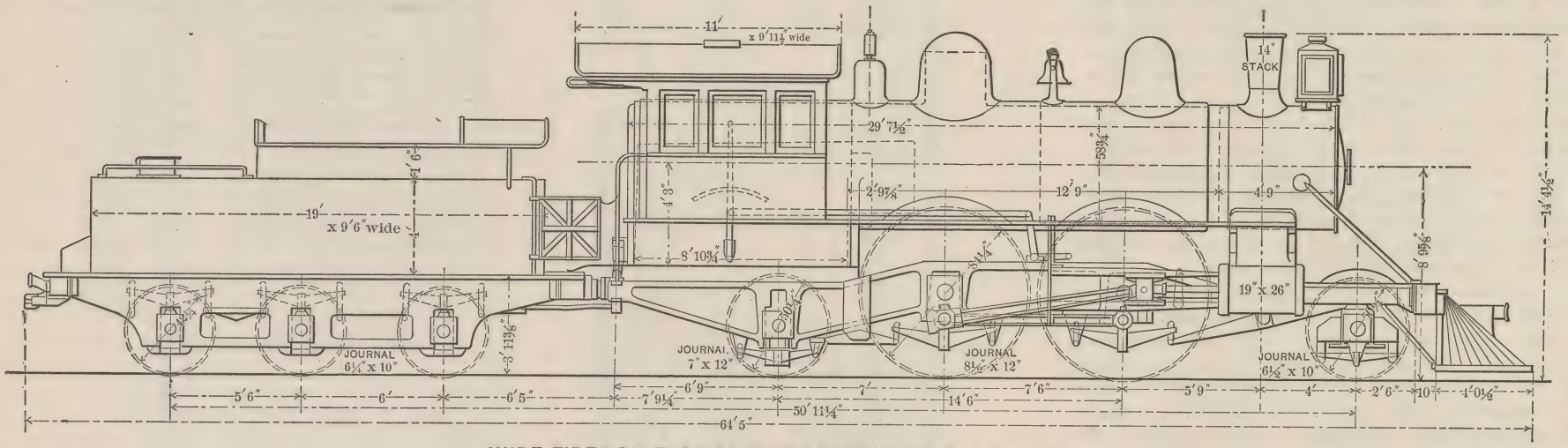
The frames are of hammered iron, made in two sections, and we give an illustration of one of these herewith. The engine is equipped with Leach's pneumatic sanding apparatus, two steam gages, a Westbell ringer, two water glasses, Westinghouse-American outside equalized brake on driving, trailing and tender wheels. The boiler, dome, steam chests and cylinders are lagged with asbestos cement, and jacketed with cold rolled pickled steel, painted. The tender carries 4,000 gallons of water and 6 tons of coal, and is itself carried on six wheels working in pedestals. The tender frame is steel. The tender wheels are 42½ inches in diameter and have wrought iron centers. The axles are of steel. The tool boxes are made of iron, as is also the roof over the coal pit. The time honored rim around the top of the tender for holding the coal on disappears in this case, and the efforts to protect the coal are confined to the coal space proper, which has high sides surrounding it and is partly covered by a roof. This will prevent the usual accumulation of rubbish. The boiler is supplied by two Sellers injectors, one No. 9½ and one No. 10½. Jerome metallic packing is used for the piston and valve stem stuffing boxes. The cylinders and air pump are lubricated by Nathan triple sight-feed lubricators. The rods have oil cups forged on solid. The driving axles are of steel, and have journals 12 inches long and 8½ inches in diameter. The following table gives some further detailed information:

Heating surface	Firebox, 187.4 square feet. Tubes, 1,392.72 square feet. Total, 1,580.12 square feet.
Grate area	44.47 square feet.
Steam ports	21 inches long by 1¾ inches wide.
Exhaust ports	25½ inches long by 6 inches wide.



HAMMERED IRON FRAME FOR C. B. & Q. WIDE FIREBOX LOCOMOTIVE.

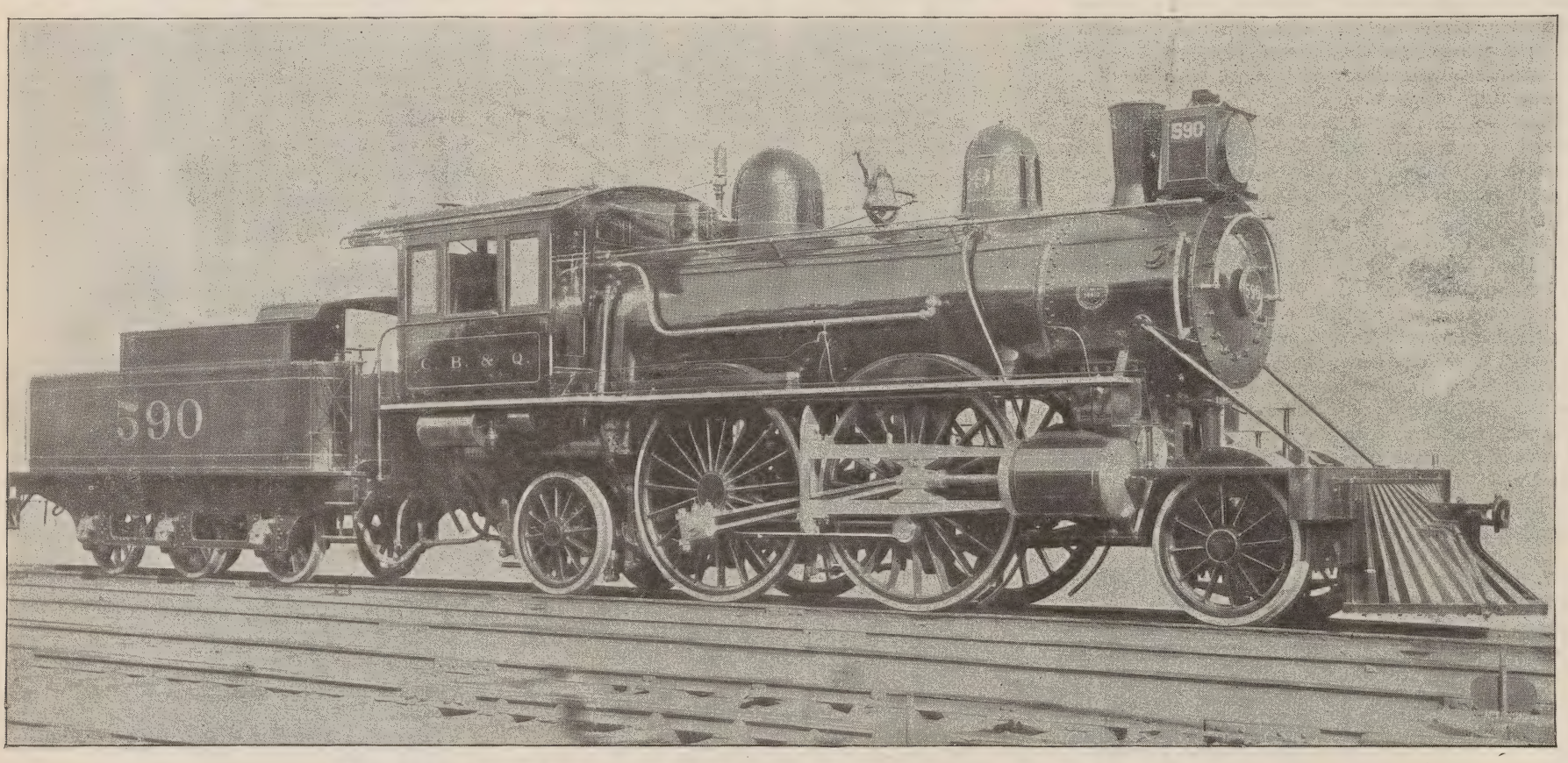
Steam pipe section area	25.9 square inches.
Valves, Piston type	10 inches in diameter.
Maximum travel	6 inches.
Lead	Full gear, $\frac{3}{32}$ inch; lap inside, 1 inch.
Clearance outside	¼ inch each end.
Radius of link	5 feet 2 inches.
Centers of cylinders, Transverse	7 feet 1 inch.
Centers of valve stems	3 feet 9 inches.
Centers of frames	3 feet 7 inches.
Bumper beams, Engine, 9 feet 9 inches long; tender, 9 feet 6 inches long.	
Pins	Main, 6 inches diameter by 6 inches long; cross-head, 3½ inches diameter by 3 inches long.
Pins, Side rods	Front, 5½ inches diameter by 4 inches long; back 6½ inches diameter by 4½ inches long.



WIDE FIREBOX FAST EXPRESS ENGINE, C. B. & Q. R. R.

The Rapid Transit Company of Xenia, O., has contracted with the George H. Mellen Company, of New York, to build an electric road between Xenia and Springfield, 22 miles long, work to bebegun Feb. 1, the company to furnish everything and turn over the road ready for operation by the middle of next summer.

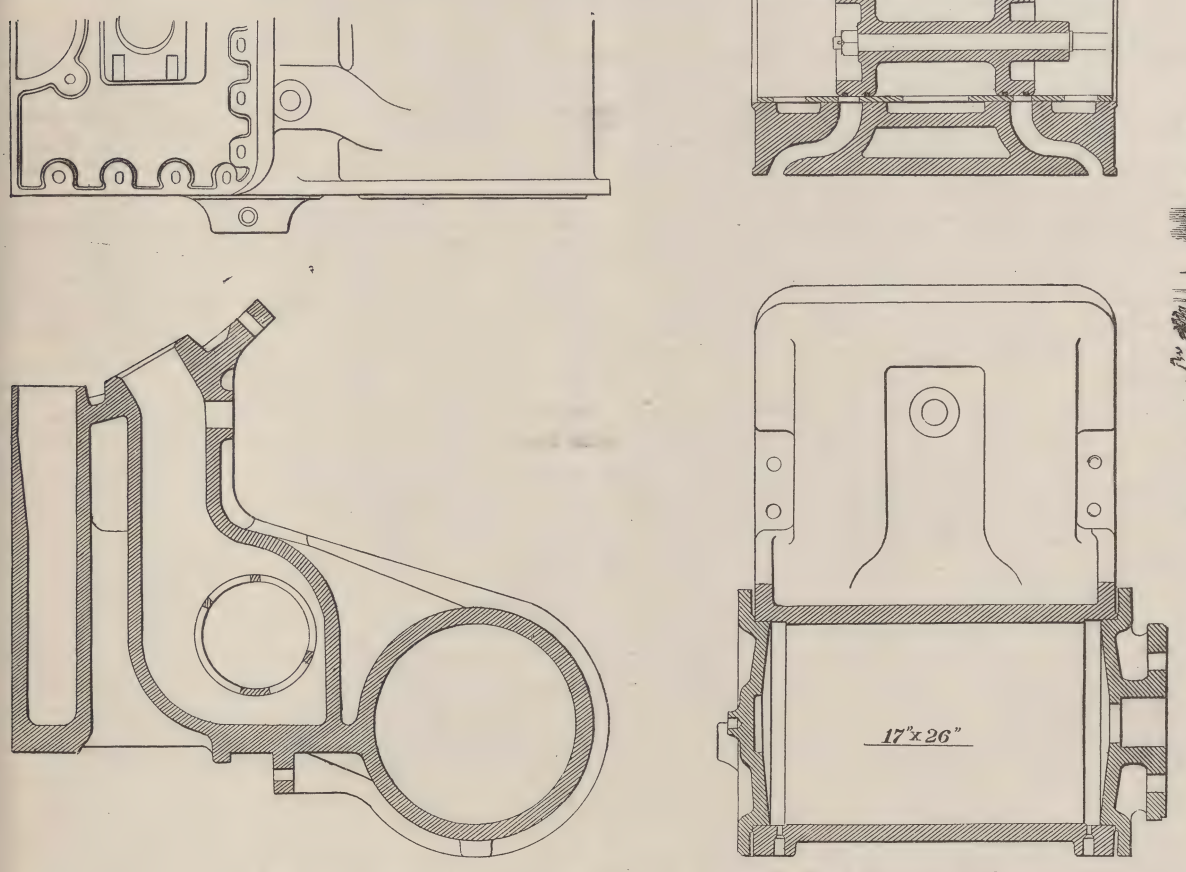
Mr. George Coppell, Chairman of the Board of Directors of the Denver & Rio Grande Railroad, says that business all over the West, and especially in Colorado, appears satisfactory. Rates are generally more stable and are a trifle better. The mining, agricultural and fruit-growing interests are flourishing all along the company's lines. Mr. Coppell estimates a surplus for October over all charges of from $140,000 to $150,000. The equipment and roadbed of the Denver and Rio Grande Railroad are in good shape, and the company is working steadily putting in seventy-five-pound rails.



NEW FAST PASSENGER LOCOMOTIVE; CHICAGO, BURLINGTON & QUINCY R. R.

Increasing Business in the West.

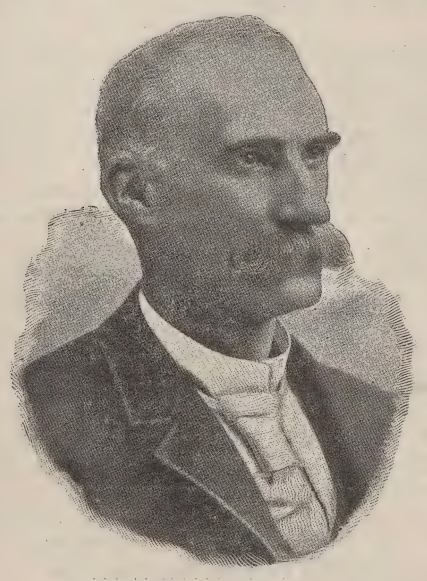
During the month of October the Chicago, Burlington & Quincy road hauled 106,000 cars of freight. October is usually a busy month with the Burlington, but only once before in its history did it move a larger tonnage in that month. In October, 1892, it handled 116,000 cars of freight. Its earnings for the month this year averaged about $30,000 a day more than those for the same month last year. These figures are quoted as an illustration of the general improvement which has taken place in the railroad situation in the West. It is but the beginning of what is to come. The Burlington is pre-eminently a corn road, and the corn crop has not yet begun to move in volume. It will not do so till about the beginning of the new year. In the mean time, general business has improved to such an extent throughout the West as to enable the Burlington to make the record it has made.



Sectional Views of Cylinder and Piston Valve; C. B. & Q. Locomotive.

The Fast Run on the L. S. & M. S. Ry.

In our last issue we published a short account of the fast run made Oct. 24 on the Lake Shore & Michigan Southern Railway, between Chicago and Buffalo. We took particular pains to have the account correct, but in spite of this a slight error crept in regarding the average speed of the train excluding stops. This was stated as being 64.98 miles per hour. The correct official figures are 65.07 miles per hour, the actual running time being 7 hours, 50 minutes and 20 seconds; instead of, as we were before officially informed, 7 hours and 53 minutes. This slight error resulted from the statement that 10 minutes and 57 seconds were lost during five stops to change engines. Afterward, and coming too late to allow correction, a further deduction of 2 minutes and 5 sections from the actual running time was made because of an actual stop in the third stage of the run by a flag.



MR. WILLIAM TUNKEY.

The Engineer who beat the World's record for fast long distance running, Oct. 24. On that date he ran L. S. & M. S. Locomotive No. 564 from Erie to Buffalo Creek, 86 miles, in 71 minutes—72.72 per hour.

Mr. W. H. Canniff, General Superintendent of the road, has prepared a table comparing the three notable runs made lately on English and American railways. A copy having been sent us, we publish it below.

Weighing a Pencil Mark

Scales are now made of such a nice adjustment that they will weigh anything, to the smallest hair plucked from the eyebrow. They are triumphs of mechanism and are inclosed in glass cases, as the slightest breath of air would impair their records. The glass cases have a sliding door, and as soon as the weight is placed in the balances the door slides down. Two pieces of paper of equal weight can be placed in the scales and an autograph written in pencil on either piece will cause the other side to ascend and the needle, which indicates the division of weight even to the ten-millionth part of a pound and less, will move from its perpendicular. A signature containing nine letters has been weighed and proved to be two milligrammes, or the fifteen thousand five hundredth part of an ounce troy.—*Practical Engineer.*

The First Artificial Track.

The evolution of the railroad track is not of such a recent date as some may imagine, says the *Roadmaster and Foreman*. As a matter of fact, history proves that as far back as 600 years B. C. the Greeks constructed special tracks through their rocky mountains by cutting out two parallel hollow grooves, which served as guides for the wheels of their wagons; these grooves were about 3 inches deep, and about 4 feet 9 inches apart, so that we may trace the adoption of our standard gage 2,500 years back. Fragments of such tracks are yet to be seen in various parts of Greece, and since the space between the grooves is found entirely rough and impassable for wheels, the grooves themselves show that great care had been taken with them in cutting them smooth, preserving true parallelism and keeping such alignment true.

FIRST LAKE SHORE & MICHIGAN SOUTHERN TRAIN, 1837, (THEN ERIE & KALAMAZOO R. R.); BETWEEN TOLEDO AND ADRAIN, 33 MILES; TIME FOUR HOURS.

These roads were constructed for the purpose of reaching the temple at Delphos with wagons laden with sacrifices, sacred vessels, etc., and since it would have been taken as an ill omen and a sign of displeasure of the gods had anything happened to wagons when on the road going to Delphos, the ancient Greeks had constructed this excellent hollow track where the treads of the wheels would encounter the least resistance, and could consequently be moved without danger of breakdown.

A southbound freight train on the Fall Brook Railroad, Nov. 16, had orders to wait for three sections of a northbound freight to pass, but the engineer of the southbound train fell asleep and on awakening pulled out before the third section had passed. A head-end collision resulted. The fireman of the northbound train was crushed into the firebox and instantly killed. His body when recovered was burned beyond recognition. The brakeman of the same train had a leg broken.

STATEMENT OF FAST TIME MADE BY NEW YORK CENTRAL & HUDSON RIVER RAILROAD, LONDON & NORTH WESTERN AND CALEDONIAN RAILWAYS (WEST COAST ROUTE), AND LAKE SHORE & MICHIGAN SOUTHERN RAILWAY.

	N. Y. Central. New York to East Buffalo.	West Coast. London to Aberdeen.	L. S. & M. S. Chicago to Buffalo.
Date	Sept. 11, 1895.	Aug. 22-23, 1895.	Oct. 24, 1895.
Weight of cars	361,000 lbs.	150,080 lbs.	304,500 lbs.
Distance through miles	436.32	539.75	510.1
First stage.			
Length, miles	142.88	15.800	87.4
Departed	5:40:30 a. m.	8:00 p. m.	3:29:27 a. m.
Arrive terminus	7:54:55 a. m.	10:27:30 p. m.	4:54:53 a. m.
Time	2 h. 14 min. 25 sec.	2 h. 27 min. 30 sec.	1 h. 25 min. 26 sec.
Speed, m. p. h.	63.79	64.27	61.38
Engine	No. 870	No. 1309 compound.	No. 597
— cylinders	19 × 24 in.	Two 14 × 30 in. / One 24 × 30 in.	17 × 24 in.
— drivers	84 in.	84 in.	Four 72 in.
Second stage.			
Length, miles	147.84	141.25	133.4
Departed	7:56:45 a. m.	10:30 p. m.	4:57:04 a. m.
Arrive terminus	10:17:10 a. m.	12:35:30 a. m.	7:01:39 a. m.
Time	2 h. 20 min. 25 sec.	2 h. 5 min. 30 sec.	2 h. 4 min. 35 sec.
Speed, m. p. h.	63.17	67.50	64.24
Engine	No. 999	No. 904	No. 599
— cylinders	19 × 24 in.	17 × 24 in.	17 × 24 in.
— drivers	86 in.	78 in.	Four 72 in.
Third stage.			
Length, miles	145.60	150.00	107.8
Departed	10:19:35 a. m.	12:38 a. m.	7:04:07 a. m.
Arrive terminus	12:32:26 p. m.	3:07:03 a. m.	8:50:13 a. m.
Time	2 h. 12 min. 51 sec.	2 h. 29 min. 30 sec.	1 h. 46 min. 6 sec
Speed, m. p. h.	65.75	60.20	60.96
Engine	No. 903	No. 90	No. 160
— cylinders	19 × 24 in.	18 × 26 in.	17 × 24 in.
— drivers	86 in.	78 in.	Four 72 in.
Fourth stage.			
Length, miles		90.50	95.5
Departed		3:09:30 a. m.	8:51:58 a. m.
Arrive terminus		4:32 a. m.	10:17:30 a. m.
Time		1 h. 22 min. 30 sec.	1 h. 25 min. 32 sec.
Speed, m. p. h.		66	66 99
Engine			No. 598
— cylinders			17 × 24 in.
— drivers			Four 72 in.
Fifth stage.			
Length, miles			86
Departed			10:19:48 a. m.
Arrive terminus			11:30:34 a. m.
Time			1 h. 10 min. 46 sec.
Speed, m. p. h.			72.91
Engine			No. 564
— cylinders			17 × 24 in.
— drivers			Six 66 in.
Through.			
Distance, miles	436.32	539.75	510.1
Time elapsed	6 h. 51 min. 56 sec.	8 h. 32 min.	8 h. 1 min. 7 sec.
Average speed	63.54	63.24	63.61
Time in motion	6 h. 47 min. 41 sec.	8 h. 25 min.	*7 h. 50 min. 20 sec.
Average speed	64 22	63.93	65.07

* Two minutes and five seconds deducted in third stage, actual stop by flag.

Wood-Working Machinery for Locomotive Work.

BY W. H. WESTON.

The necessity for an efficient supply of wood-working machinery in connection with a motive power department is very great, and liberal consideration in this matter is advantageous. Of course, there is much work in wood that can be done by hand if machines are not provided, but such work takes a much greater length of time to perform, and in the case of duplicate parts being turned out, they are not nearly as uniform if done by hand as they will be if produced by proper wood-working machines. If an extra number of men must be employed to do the work that might be done by machinery in a fraction of the time, it is obvious that it would be far cheaper to buy machinery and pay the interest on its cost, than to go on year after year paying an extra force of men.

Now that the great importance and advantage of having standards for the construction of woodwork as well as for the metal work in engine building has become generally conceded, it is all the more necessary to have a good supply of tools. Taking into consideration the matter of cab construction, there is no doubt but that in most instances a road should have a standard form of cab and details, because a cab can be made that will be suitable to most any engine of a similar class on a road. And if it is necessary to have two sizes of cab, in order to have them available for the greater part of the engines, then the probability is that the form of details can be kept alike in both, and very likely the dimensions of many of the details can be kept the same in both sizes of cab. But, even if it is necessary to have separate dimensions for the details of the two sizes of cab, it will be far better to have the two distinct standards than to have none at all.

An engine cab is a thing that deteriorates and rattles to pieces fast, and it is consequently of importance to have quick and easy means of replacing or repairing them, and the only way to reach this result is to have them built to standards. Then a new one will readily go on in place of an old one, and in case of repairs, any details that may be broken or rotten can be replaced easily; and if the various parts are kept in stock the repairs can be quickly done.

Taking the matter of pilots and front beams, a standard form of pilot and its fastenings can be had. And then the replacing of them becomes an easy matter. For if pilots are of standard dimensions, and the arrangement of bolting and bracing is fixed at a standard as to size of bolts and their spacing, then a new pilot can be put onto an engine quickly and at much less cost than would be the case if a new pilot had to be built for the engine, or if one that was in stock had to be specially arranged so as to conform to the odd dimensions and spacing of bolts where no standards were in use. Of course, I do not mean that standard cabs and pilots can be made that will go on to any engine of a road. But that they can be so made as to be used on a large portion of a road's engines, and that standards so adopted will reduce expenses and facilitate construction and repairs to a marked degree. As to the matter of keeping these things in stock, this can be done if standards are adopted; and if not adopted there is no practical way of keeping such things in stock.

On some roads where the engine and car works are all in one, the question of wood-working machinery is a more extended one; and sufficient machines are usually at hand for the production of the work of the engine department. But the subject especially considered here is the equipment of a shop for engine work only. There is only a moderate variety of wood-working tools for this purpose, and it requires about as many machines for a small shop as for a large one. For even in a shop of good size, the machines, or some of them, will necessarily stand idle some of the time as well as in a small shop. The point of importance being to have them for what work there is, and they will be a good paying investment even if used but a part of the time. It not being necessary to have a workman for each machine as in some other lines of work, this does not figure against a wood-working tool in a department of this sort. For instance, in a shop where there are five or six different machines, perhaps two workmen will be all that are necessary to handle the whole of the tools, running each one as occasion may require.

There is always a great disadvantage in trying to do work without proper tools, and even if the tools stand idle part of the time, as in this instance, it is far cheaper to have them than to pull through the work without them by employing more men and taking a longer time to do it.

As was just mentioned, the number of machines for the wood-working department of engine shop is not large, and as the individual machines are not large or heavy the total expense of equipment is a moderate amount, and consequently this expense should not stand in the way of securing the machinery, if the road is in condition to buy anything. This department of any locomotive works is an important one, and should be so considered if the interests of the concern are properly taken into account, for the amount of work for it to do is considerable and should be well done.

In putting a pattern-makers lathe into use, these points should be observed if the tool is to do good work and prove satisfactory: In form it should be a gap lathe. The bed should be a heavy casting, made thick and well ribbed, so as to prevent any springing out of line, and so that vibration will be prevented or absorbed when the lathe is running at a high speed. This latter being a point of very great importance in securing a good wood-working lathe. The headstock should be heavy, and the spindle journals of large area, and the cone well balanced. A friction brake is also an advantage. The slide-rest should always be gibbed to the bed, and should be so constructed that bevels inside and outside can be readily turned. In general, the lathe should be built of the best material and with thoroughly first-class workmanship. Lathes that are poorly constructed are dear at any price. A good assortment of face-plates; spur, pointed and screw centers; T rests, wrenches, etc., should be supplied.

Trying to do extensive pattern work with lathes of light cheap construction, or with wooden beds is a shiftless way of doing business, because neither the quantity nor the quality of the work produced is what it should be. In regard to pattern work it may be said that cheap work in this department is very expensive. And that consequently the best of tools and workmen should always be employed.

A sawing machine of moderate size, having rip and cut-off saws of 12 or 14 inches diameter, should be supplied for pattern use; the saws so mounted as to be elevated to any height above the table, and when not in use depressed below it. Gages and guides to be provided so that sawing to angles and levels can be readily done. Such a machine should be constructed wholly of metal, and so accurately made that it will do the most exact work, and be thoroughly reliable, strong and solid in form, and easily run. The object of the machine being to saw to finished sizes when desired.

Among the other machinery for the wood-working department of a locomotive repair shop are: mortising machines, mutiple-spindle boring machines, large and small planers, circular saw, band saw, etc. There is none of this machinery but what is absolutely necessary in the department, if the work is to be done rapidly and to accurate standards, and at a fair cost; and no shop that does any amount of work at all is properly equipped without at least one of each of the named machines.

The mortiser is a tool of special importance in facilitating work, and should never be omitted. The vertical mortiser probably being more advisable than the horizontal for locomotive work. It also being important to secure a strong solid machine with a broad firm base. The table should be large and easily adjustable, and ample means provided for clamping the work quickly and firmly.

The multiple-spindle borer is also a very efficient tool in the way of expediting work. For where any given piece of timber is to be bored with a number of holes of various sizes, the placing of the corresponding bits in the machine and doing all the boring without stopping the machine or changing the bits, allows the work to be done very quickly in comparison to the use of a one-spindle machine.

As to the planing machines. For locomotive work it is, of course, not necessary to have the most extensive complicated planers, it being more necessary to have them with as few parts as possible. The least complicated machines will do all the work required, and are to be had at far less cost.

The band saw is a machine that may be a good one or it may be very inferior, and it is therefore necessary in purchasing one to give it thorough consideration, one of the principal points being to secure a machine that will stand firm when running, and not travel all over the shop. A small circular saw is a valuable addition to the equipment of a department for locomotive work.

Two cars and the caboose of a heavy freight train on the Southern Railway broke loose from the train on a heavy grade near Corona, Ala., Nov. 16, and started back down the hill. The conductor was the only man on the detached cars, and he applied the hand brakes; but before this was done the cars were running away. They attained a high rate of speed, and after running six miles dashed into an express train, resulting in the death of the conductor and the wrecking of the express locomotive and the freight cars. No passengers were hurt.

Mexican Central Ten-Wheel Freight Engine.

The Brooks Locomotive Works recently completed and shipped to Mexico five locomotives similar to the one illustrated herewith. These locomotives are intended for mixed passenger and freight service. They were built according to drawings prepared by Mr. F. W. Johnstone, Superintendent of Motive Power of the Mexican Central Railway. The cylinders are 20 inches by 24 inches, driving wheels 56 inches in diameter, and the boiler 60 inches in diameter. The engine weighs 134,090 pounds in working order, of which 104,000 pounds are carried on the drivers. The boiler-pressure carried is 180 pounds. Bituminous coal will be used with these engines, and the firebox is 120 inches long and 31⅜ inches wide.

The boiler is of the Belpaire type and is made of Otis steel plates, the waste sheet being ⅝ inch thick, throat sheet $\frac{11}{16}$ inch thick and front flue sheet ½ inch thick. The boiler contains 225 Franklinite iron tubes, with copper ferrules on firebox ends. These are 2 inches in diameter and 13 feet $2\frac{9}{16}$ inches long, spaced 3 inches from center to center.

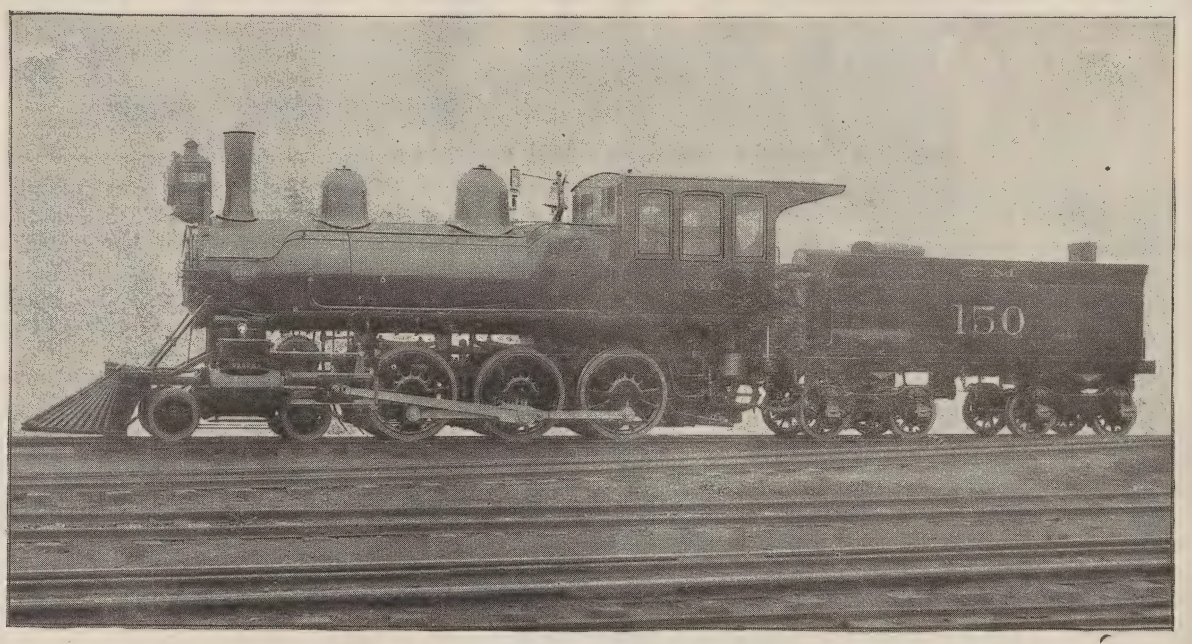
The crown sheet is ⅜ inch thick, side sheets $\frac{5}{16}$ inch thick, back sheet $\frac{5}{16}$ inch thick, and flue sheet ½ inch thick. The water space is 4 inches at back, 3½ inches at sides, and 4 inches in front. The stay bolts are of double refined iron 1 and ⅞ inch diameter spaced 4¼ inches from center to center, screwed and riveted over sheets at both ends.

The crown sheet is supported by through stay bolts with cast steel nuts, the three front rows being sling stays. The boiler has 1,764 square feet of heating surface, of which the firebox gives 209 and the tubes 1,555 square feet. Blow off cocks are provided on both sides of the firebox and one in the belly of the boiler.

All axles are of hammered iron. All wheels have cast iron centers and steel tires, Krupp steel being used for the drivers and the Midvale steel for the other wheels. The pistons are of cast iron. The piston rods are of Low Moor iron, and the guides are of cast iron, the cross heads are of cast steel with babitted gibs. Balanced valves are used.

The engine truck is of the rigid, swiveling type with a wrought iron frame. The journals are fitted with Johnstone's sectional brasses. The crank pins are made of Low Moor iron, not case hardened. The rods are of hammered iron, and have solid ends, except the main rods, which are fitted with straps and brasses. The feed water is supplied with two No. 8 Nathan injectors. A Nathan lubricator is provided for the cylinders. The cab is built of tank steel.

The tender has Fox pressed steel trucks, and the frame is made of steel channels. The tank is made of steel plates. The side plates being $\frac{5}{16}$ inch thick, and the top and bottom plates ¼ inch thick. It holds 4,500 gallons. The boiler, dome and cylinders are lagged with wood. The running boards are of tank steel with T-steel nosing. The engine is equipped with Westinghouse train brake and signal, the American driver brake, and the Le Chetalier water brake, and Ross Meehan driver brake shoes.



Ten-Wheel Freight Engine, Mexican Central Railway.

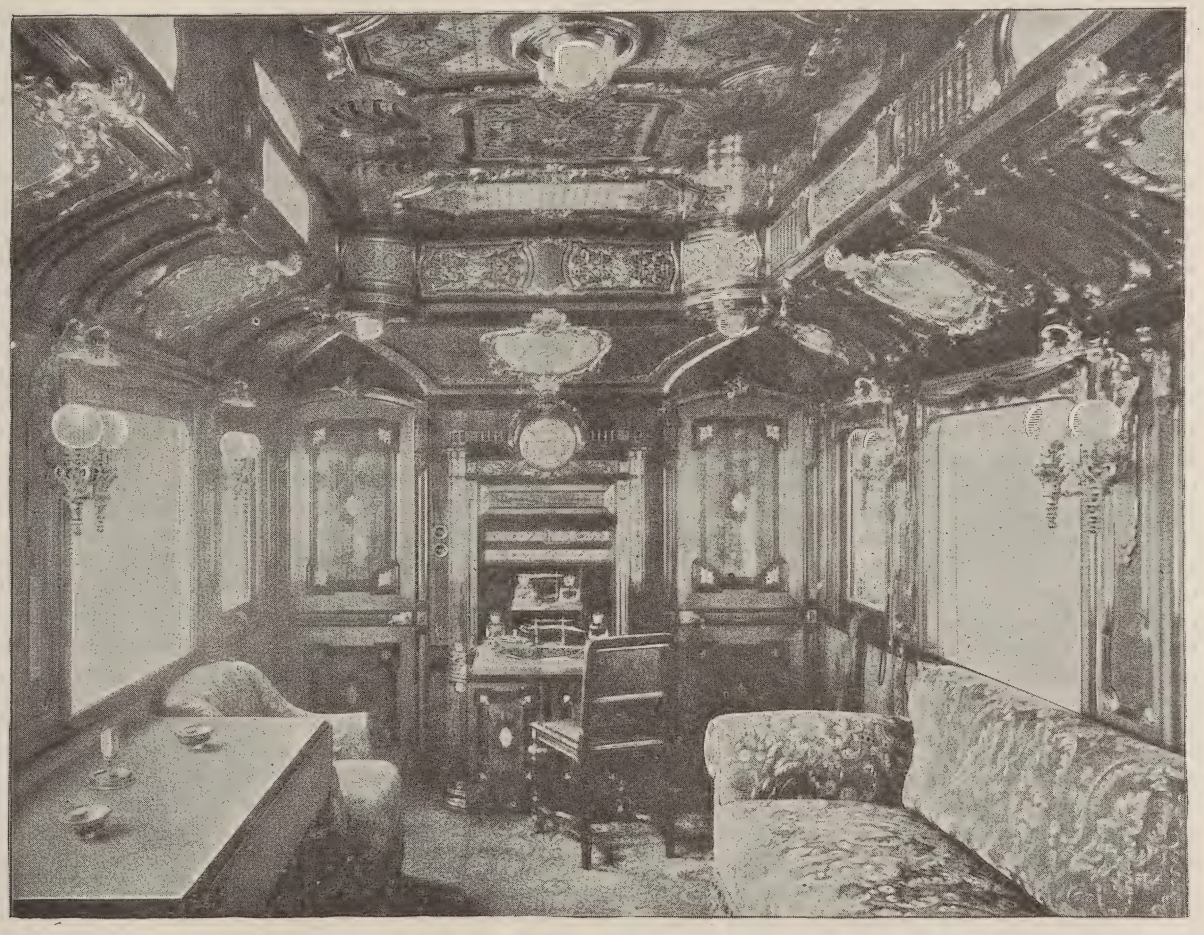
The Foreign Mail Service.

Captain N. M. Brooks, superintendent of the Foreign Mail Service, has submitted an interesting report showing the valuable service rendered by his bureau in the transportation of foreign mails. The aggregate weight of mails sent by sea in the year was 5,758,698 pounds. The cost of the transatlantic service was $607,698; for the transpacific service $88,494, and for miscellaneous service $366,699. Including other expenses and deducting amounts paid to the United States for service, the actual cost for the fiscal year was $1,173,561. The amount estimated as necessary for the next fiscal year is $2,030,000. Referring to the Universal Postal Union, Mr. Brooks says that when Corea and the Orange Free State shall have been admitted, only the Chinese Empire will remain outside.

The German Kaiser's Train.

A couple of years ago a train composed of 12 cars was constructed in Germany for the Emperor and his suite as follows:

No. 1.—The Emperor's saloon car.
No. 2.—Saloon car for the Emperor and Empress.
No. 3.—Car for the Emperor's retinue.
No. 4.—Car for the Empress' retinue.
No. 5.—Car for the Emperor's attendants.



Interior View of the German Emperor's Private Car.

No. 6.—Car for the Empress' attendants.
No. 7.—Dining car.
No. 8.—Kitchen car.
No. 9 and 10.—Baggage and servants' cars.
No. 11.—Saloon car for the Emperor, to be used for short journeys and when No. 1 is being repaired.
No. 12.—Combined dining and kitchen car for short journeys.

Numbers 3. 4. 5, 6 were constructed in private shops at Görlitz and the others by the Breslau Actien-Gesellshaft, which, it will be remembered, exhibited a six-wheel passenger vehicle at the Columbian Exposition. The entire train is reported to have cost over a half a million dollars. The Emperor's saloon car, 50 feet 9 inches long over the body, contains five separate compartments—one for the servants, two for the gentlemen of the Emperor's retinue, the Emperor's sleeping chamber and the saloon.

The views illustrate opposite ends of the latter—that with the door in the centre being the end adjacent to the platform. The doors at the right and left in the other view lead respectively to the Emperor's sleeping chamber and to a side passage the length of the car.

The interior finish is of mahogany, walnut and olive wood; the ceiling in gold and blue, and the carpet a moquette of a dark indigo color. The ornamentation and furnishings are of the most elaborate nature, and reveal the characteristic features of pure German art.

American Locomotives for Europe.

The order for 40 locomotives for Russian railroads, received by the Baldwin Locomotive Works and announced in our last issue, has caused considerable surprise and comment in Europe. A French engineering journal, *La Geine Civil*, says:

"That a new country, as North America must still be regarded from many points of view, should be able to supply its own needs is in itself a remarkable fact. This, however, does not seem to satisfy the activity of its people, with which Europe will have to count in future on the battle-ground of industry. The news that comes to us from the United States of an order for forty locomotives for Russia, placed with the Baldwin Works of Philadelphia, will be received with a certain degree of surprise on this side of the Atlantic, especially if, as we are told, this order is to be followed by more important ones. Already in the matter of furnishing railroad material American constructors had taken possession of the South American market, and were carrying on a formidable competition against the English in their own colonies, especially in New Zealand and Australia, but it was hardly expected that they would be seen obtaining a foothold in Europe."

On Nov. 12 a special train on the Big Four ran from Cleveland to Cincinnati, 263 miles, in five hours and 25 minutes, averaging over 50 miles per hour. The best time previously was six hours. The train was a heavy one, consisting of a baggage car, two diners and seven Wagner sleepers.

Up the Jungfrau.

The projected trolley line to the summit of the Jungfrau will be, it is said, finished in time to be opened to the public on June 1, 1900. The cost of the enterprise will be about $1,600,000. There is already a railway to the Scheidegg, at a height of about 6,500 feet. This will be utilized in the trolley ascent of the Jungfrau, and the entire length of the line will be about seven miles, of which more than six miles will be by tunnel, in order that the route may be safe from avalanches. From the Scheidegg the line will make for the flank of Mt. Eiger. Within the interior of the latter the route will turn and extend toward the neighboring Mt. Moech. The first station will be 10,567 feet above sea level. The station on Mt. Moech will be at a height of 11,800 feet, and will command a splendid panorama of the Lauterbrunnen Valley.

The terminal station will be under ground, and at a height of 13,754 feet. Here will be a restaurant and hotel for travelers. The station will be 220 feet below the actual summit of the Jungfrau. The remaining distance will be accomplished in an elevator. There will be a pavilion on top, whence the tourist may view in comfort the vast stretch of mountain and valley below. Passengers will be able to learn from carefully graduated little barometers the actual height above sea level at any point of the journey. The height of the Schiedegg, at which the actual ascent of the Jungfrau by trolley will begin, is about 6,750 feet, and the journey thence to the summit of the mountain will be made in somewhat more than an hour. Only one car will be despatched at a time. The electric current will be generated by the aid of a waterfall, and an electric plant to be run by this fall will be set up next summer to aid in boring the tunnels of the proposed line.

Railroad Earning Improving.

The Interstate Commerce Commission has issued a preliminary report on the income and expenditures of railways in the United States for the last fiscal year. The report includes the returns from 650 roads whose reports were filed on or before Nov. 9, 1895,, and covers the operations of 164,529 miles of line, or 92 per cent. of the total mileage in the United States. The gross earnings are $1,003,022,853, of which $293,465,792 was from passenger service, $683,-022.988 from freight service and $26,217,595 was other earnings from operation, covering earnings from telegraph, car mileage, balance, switching charges, etc. The operating expenses were $677,677,635, leaving net earnings of $325,355,218, as compared with net earnings of $320,137,670 for the same roads in 1894.

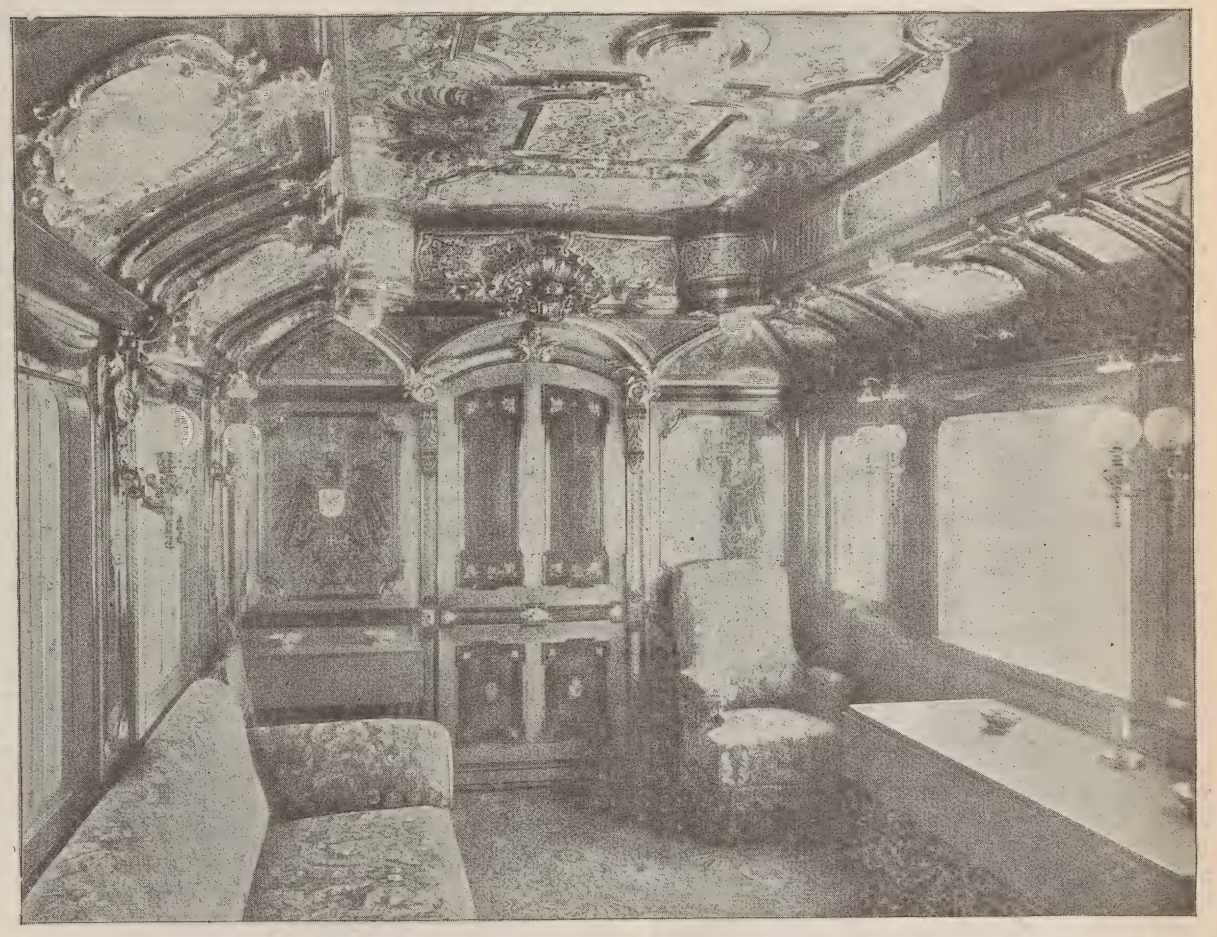
Reduced to a mileage basis, gross earnings were $6,096, operating expenses were $4,119, and net earnings were $1,977. or a decrease in gross earnings of $13 per mile as compared with 1894, and of $1,094 per mile as compared with 1893; a decrease in operating expenses of $44 per mile as compared with 1894, and of $757 per mile as compared with 1893. Net earnings show gain over 1894 of $31 per mile of line. but a decrease of $337 per mile as compared with 1893. Passenger receipts fell off $177 per mile as compared with 1894, while freight receipts show a gain of $149 per mile. Passenger receipts were $336 per mile less than in 1893, and freight receipts show a decrease as compared with that year of $755 per mile.

Income from sources outside of the operations of the roads was $33,057,243, making a total income available for the payment of fixed charges and dividends $358,421,461. Total deductions from income, including fixed charges were $336,351,946, and dividends paid were $53,135,545 leaving a deficit from the operations of the year of $31 075,030. The dividends paid by the same roads the preceding year were $61,504,785.

The Largest Mirror.

The largest French plate-glass mirror ever brought to this country, and the largest mirror in the world was set up in the dining-room of the Hotel Savoy in New York, Nov. 19. It is 158 by 158 inches square, making nearly 174 square feet of glass. It is nearly half an inch thick. The mirror is not only the largest, but the most expensive, in the world, its actual cost being in the neighborhood of $5,000. It would have cost but a thousand dollars to manufacture a single glass, but five different glasses had to be cast before this perfect one was made.

There are but two steamships in commission which could store so large a package away in their holds. These are the *Friesland* and the *Kensington*. It came on the *Friesland*. The mirror was made at the old St. Gobain glass factory in Paris, the oldest plate-glass factory in the world. So large a mirror could not have been made in this country with the present facilities here.



Interior View of the German Emperor's Private Car.

NATIONAL CAR AND LOCOMOTIVE BUILDER

ESTABLISHED IN 1870.

PUBLISHED MONTHLY

BY

R. M. VAN ARSDALE,

MORSE BUILDING.....NEW YORK.

GEORGE H. BAKER, Editor.

HERBERT W. POOL, Business Manager.

DECEMBER, 1895.

Subscription.—*$2.00 a year for the United States and Canada; $2.50 a year to Foreign Countries embraced in the Universal Postal Union.*

EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING PAGES. *The reading pages will contain only such matter as we consider of interest to our readers.*

Special Notice.—*As the* NATIONAL CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, correspondence, advertisements, etc., intended for insertion must be received not later than the 25th day of each month.*

Contributions.—*Articles relating to railway rolling stock construction and management and kindred topics, by those who are practically acquainted with these subjects, are specially desired. Also early notices of official changes, and additions of new equipment for the road or the shop, by purchase or construction.*

To Subscribers.—*The* NATIONAL CAR AND LOCOMOTIVE BUILDER *is mailed regularly to every subscriber each month. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery, and in case the paper is not then obtained this office should be notified, so that the missing paper may be supplied.* **When a subscriber changes his address** *he ought to notify this office at once, so that the paper may be sent to the proper destination.*

TREATMENT OF EMPLOYEES.

The dawn of a new era in the treatment of railroad employees is certainly upon us, and is proved by the attention that is being given the matter by individual and associated railroad officers. President Ashley, of the Wabash, has written a book on the subject, and advocates the establishment of such insurance and pension arrangements and such general treatment of employees as will make them feel that their interests and those of the employing company are identical. By this he justly expects that the efficiency of the service will be promoted, because of the loyal zeal the men will exercise in the performance of their respective duties. Following practically the same ideas, a number of railroads have discontinued suspending employees from the service for minor offenses, and instead a system of charges and credits is adopted by which negligence is recorded and attention is called to the fact. A sufficient amount of negligence will bring dismissal. Praiseworthy acts or performances are credited in this plan, and so each employee can work with the knowledge that the excellence of his record and the prospect of his continued employment depends upon his own exertions. By specially good work he can accumulate a stock of credits that would practically insure him against dismissal in case of some oversight or error that otherwise would deprive him of employment. This is certainly a beneficent plan, and its advantages are just as certainly not one sided. The employee gains in purse, in self-respect, and in inte rest and loyalty for the railroad he serves. These qualities all combine to make a more efficient man, and a more efficient and economical service.

A superintendent, in discussing this matter some time ago, said that he suspected that the men constituting the working forces of railroads had grown a good deal in the last 10 or 15 years, while the methods of maintaining discipline had stood still. He hit the nail on the head. As a class, railroad men are much in advance intellectually now compared with the period named. Being so, the best treatment to secure their most effectual service must be an intelligent treatment, and one in which the element of force is not predominent. There are very few ways in which railroad service can be improved for the benefit of owners and patrons so well as by cultivating a spirit of loyalty in the working force, and more enlightened and considerate treatment of employees than has been customary are the best means to accomplish this.

WINTER LUBRICATION OF ROLLING STOCK.

With the advent of cold weather the duty reoccurs for us to speak again of the necessity of those in charge of railroad rolling stock giving particular attention to the changing conditions affecting the proper lubrication of the running gear of the same. On another page we tell of a system of rating engines according to the prevailing temperature adopted on a certain road. The regulations permit of the train load being reduced 100 tons for every 10 degrees fall of temperature below 40 degrees Fahrenheit. Practical men know that this reduction is necessary, and that in practice it will probably have to be more than that stated; yet is it not a fact that the reason for this necessity is not studied out as often and as thoroughly as it should be? Does every one charged with the duty of seeing that cars and engines are properly lubricated understand why it is that trains pull harder in cold than in warm weather? They should do so. Every engineer and every car foreman, as well as the heads of their respective departments, should hold a clear conception of the cause of this great retardation of traffic in cold weather. It is very simple—simply friction, friction of oil; friction of the particles among each other, when set in motion, of thick, sticky oil that has become congealed by cold. Friction is always a retarding force, and in fluids as well as between solids it acts the same, to retard motion and absorb moving energy by converting it into heat, in proportion as the objects or particles set in motion adhere to each other.

In a machine the rubbing surfaces are lubricated in order that they will not adhere to each other, but on the contrary be separated from each other by a film of oil that prevents actual contact. In a lubricant, as well as in a machine, it is necessary for the easiest movement of its parts (or particles) that there shall be slight adhesion. This condition prevails when the lubricant is in the liquid state, and when not so friction exists and retards the movements of the particles, and in turn the motion of the machine, the locomotive or the car. The effects of this friction in lubricating oil is seen in the 100 tons reduction per train load per 10 degrees colder temperature noted above. It is seen again in the largely increased coal consumption of locomotives in cold weather; for while there is considerable increase in this to meet the requirements of colder feed water, and colder air for the fire, and the loss of increased radiation of heat, yet it is principally caused by the increased resistance of trains. With congealed oil inefficiently lubricating the journals of the cars and the exterior rubbing parts of the engine, every particle of oil is unceasingly acting as a brake and retarding the motion of the train. With a decreased load and perhaps an increased use of steam this may not be so manifest while running along normally, but the moment steam is shut off to run down grade or into a station, as is customary in summer, it is evident immediately that a giant force is retarding the free running of the train. To overcome this steam must be used over many miles of descending grade in winter, and over many more miles approaching stations, which in summer are rapidly run over with steam shut off. In common practice locomotives burn about .03 pound of coal more per freight-car mile for each degree of colder temperature, and about double this per passenger-car mile. It is evident that with a large car mileage these hundredths of a pound of coal are multiplied into thousands of tons.

Understanding the cause of this expensive brake on the movement of traffic it is well to consider if means can be adopted to mitigate its evil results. All that is necessary is to lubricate the journals of cars and locomotives with oil that, while of sufficient body to perform its duty of separating the journals and bearings, will yet remain in a liquid consistency in service. Many railroads have taken a step toward this in recent years by using a lighter grade of lubricating oil in winter than that used in summer, but the movement is far from general, and stops far short of where it should be carried to—maintaining a liquid consistency of lubricating oil in service in the coldest weather. With the now general and frequent interchange of freight cars this might be somewhat difficult to accomplish except by concerted action; but it is worthy of this, and there is no good reason why all cars that are kept on the home road should not be as carefully and as properly lubricated in service between the extremes of 50 degrees above zero and the same below, as the pet stationary engine at the main shops. It is simply a question of attention, and a liquid consistency of the lubricant.

THE LOCOMOTIVE ENGINEER.

We mean the engineer that runs the engine, not the mechanical engineer that designed it. They are both engineers, and, in their respective fields of usefulness to the world deserve a high place in the esteem of civilization. Both are possessed of considerable knowledge, although the kinds of knowledge possessed by each are very different. Each kind is as necessary to the all around success of the engine as the other. Years ago there was some unseemly quarreling as to who should be called an engineer, the man that builds or the man that runs an engine. Happily we hear no more of this, although in nearly every other country in the world the men who run engines are called "drivers." Americans call them engineers. The locomotive engineer is generally a much respected individual among railroad men and railroad communities. Sobriety and industry are essential to his position. Intelligence is an absolute necessity, and a clear head and a cool nerve are his everyday attributes. His life is simple, his pay is fairly good, and he is generally an honest man. Generally a man must possess a certain standard of excellence in regard to the qualities just named, or he does not become a locomotive engineer. The business of running a locomotive fosters these qualities, and makes them permanent characteristics.

Of course the locomotive engineer does not know all he should know about the science of steam engineering, just as the mechanical engineer, who builds engines, does not know all he should about the science of running locomotives, and about the conditions operating in actual service. If these respective kinds of knowledge could be more generally diffused between engineers who build and engineers who run locomotives, both the economy and efficiency of these most useful machines would be highly increased. However, things are improving in this respect; the light is beginning to be diffused. The locomotive engineer is a much better posted man than he was six years ago, and five years hence he will know much more about the science of his business than he does now, and he will therefore be a much more valuable servant of the interests that employ him. He now frequently attends schools of instruction provided by his employing company, and, to his credit be it said, such attendance is generally willing, frequently anxious, and rarely in displeasure. His willingness to learn is manifest, and gives great hopes for the future.

We have been prompted to make these remarks because the locomotive engineer is not usually appreciated as he should be, even by railroad officers with whom such appreciation is a real duty. We do not mean that he should be made a favorite or given privileges not given other employees. We mean that he is an important factor in the efficient and economical operation of locomotives, and that his value as such is not generally recognized or appreciated. He is the man who can affect the cost of the operation of a railroad more than any other in a subordinate position. The difference between what is a generally allowable carelessness in the performance of his work, and the zeal for economy with which it should be done, means many thousands of dollars annually on any road with a hundred locomotives. Sometimes he is too frequently blamed, and he is too seldom praised for good work or economical performance. In the recent fastest long distance run ever made, the engineer by whose skill and knowledge and nerve the feat was accomplished was barely mentioned, although Mr. William Tunkey was as much a dominant factor in the achievement as was his now famous engine, No. 564. The purely mechanical engineer does not exist who could have made that run. The locomotive engineer is deserving of more attention than is usually given him to assure that he is up to the proper degree of efficiency, and to encourage him being so. Justice and the interests of stockholders are at stake.

A correspondent in this issue expresses the opinion that the best way to make heavy capacity cars safe is to place a third truck beneath the middle, thus making two spans instead of one between the trucks at the ends. For very heavy loads the plan named is not only proper, but absolutely necessary, and, as he says, such cars are not uncommon, and we have no doubt that they have proved satisfactory for the purpose they were designed for. The day is far distant, however, when this will become a largely used form of construction for cars engaged in ordinary traffic. A large proportion of wrecks are now caused by defective wheels and axles and other truck failures. Multiplying the number of trucks in use will naturally increase the chances of disaster. The more wheels and axles there are running the more there will be to break. The whole trend of improvement in American railroad rolling stock is toward fewness and simplicity of parts. Whenever possible and of advantage parts are made lighter as well as stronger and fewer, but when necessary there will be slight hesitation to make them heavier and stronger, within reasonable limits, rather than more numerous. Greater cost of maintenance, as well as greater probability of accident, lies in multiplicity of parts.

We mention on another page a fatal locomotive boiler explosion occurring in November. The decrease in the frequency of these disasters in the last two years speaks great praise for the increased care of master mechanics in matters of inspection and repair. Very few boilers fail in service from defects in design, or from unfit material used in their construction. Explosions generally result from either neglect in boiler feeding, neglect of proper and frequent inspection, or neglect of needed repairs. The best insurance against their occurrence is unceasing vigilance in these respects by all who are in any way responsible for the safety of boilers.

The wrecking of the fast mail train on the New York Central, near Rome, N. Y., by boys purposely loosening two rails in proximity to a 12-foot ditch, has been so widely published as to make it superfluous for us to repeat the details. Two men were killed and ten injured, and the locomotive and several cars were wrecked. For pure malicious devilishness the action of these young imps is not surpassed. They are to be tried for murder in the first degree, and conviction is most certain. Upon conviction they cannot be too speedily put under the ground, the only good place for train wreckers.

Literature.

Poor's Directory of Railway Officials and Manual of American Street Railways. Tenth Annual Issue; edition of November, 1895. Royal octavo cloth, pp. 74 and 616. Price, $3 per copy. H. V. & H. W. Poor, 44 Broad street, New York.

This publication has come to be too well and favorably known to require much of an introductory notice from us. Numerous new features have been introduced in this edition that will make it more valuable to those interested in its information. It is revised and corrected to Oct. 25 of this year, and contains nearly 700 pages.

Of the total railroad mileage in the United States, aggregating on the 1st of October, 1895, 180,815 miles, no less than 38,613 miles are operated under receivership. A full list of these roads with their capitalization is given in the introduction to the Directory and is one of the most important tables in the book.

We also learn from this book that the rapid substitution of electric traction for animal power may be judged by the fact that since 1891 the number of horses employed in the street railway service has declined nearly 145,000 or about 71 per cent.

Report of 26th Annual Convention of the Master Car and Locomotive Painters' Association. Railroad Car Journal. New York.

This is the official report of the late convention of this association at Cincinnati, O. It is very nicely bound in cloth, with gold letters, and in this respect is far ahead of the reports of the M. C. B. or Master Mechanics' Associations, although the former made a stagger at a cloth bound report on the last occasion, which we hope to see improved on in the next. The Master Mechanics' Association does not seem to have awakened yet to the necessity of a substantial cover for the reports of its proceedings.

Sketch Portfolio of Railroad Stations. By Bradford L. Gilbert, Architect. The *Railroad Gazette*, New York.

This is a very neatly and substantially bound portfolio of nearly 200 illustrations of railroad structures. The work is very nicely executed, the illustrations are sufficiently described, and the whole is printed on excellent paper.

Wrecks on the Lackawanna.

A rear end collision between two gravel trains on the Delaware, Lackawanna & Western Railroad occurred Nov. 7. A heavy fog prevailed. The leading train had stopped at a gravel pit after leaving a torpedo on the track some distance in the rear. The following train had a flat car in front of the locomotive. This flat car exploded the torpedo, the sound of which did not reach the engineer.

A week later another collision occurred on the same road through bad management, by which two passenger locomotives were wrecked and the road blocked for several hours. Two passenger trains are run close together from Hoboken to Montclair, the following train being the express. The local train usually, it is stated, discharges its passengers and baggage at the depot at Montclair and afterward backs up in the face of the approaching express, and into a sidetrack to allow the express to pass. This was done on the occasion mentioned, but before the local could accomplish the feat it was dashed into by the oncoming express. The engines collided.

The climax was capped on Nov. 13, when a local freight train engaged in switching at Summit, N. J., started its caboose and three loaded box cars, unmanned, down a steep grade in the face of an approaching passenger train. The resulting collision killed the engineer of the passenger train, and wrecked the passenger engine and six cars. The combustible part of the wreckage was immediately consumed by fire caused by coals from the locmotive firebox and a stove in the caboose.

A Japanese Locomotive.

According to a correspondent of the *Glasgow Herald* the Japanese have determined to build s many of their own locomotives as possible, and they have ordered eight compound tender locomotives, after thoroughly testing the efficiency of a Japanese-built engine working in competition with one imported from Great Britain. Some particulars of this Japanese compound engine may be given before costs are compared. The gage is 3 feet 6 inches; the engine cylinders are 15 inches and 22½ inches diameter, 20-inch stroke; Joy's radial valve motion is fitted to both valves, the valves being of phosphor bronze; the boiler shell is of the best Yorkshire iron, and the tubes of brass; the total heating surface is 769.57 square feet, and the grate area 12.4 square feet. The weight of the engine is 40 tons, and the weight available for traction 21½ tons. The British engine was noncompound, the cylinder being 14 inches in diameter by 20 inch stroke, the weight being 35 tons, and available for traction 20½ tons. It had the same water capacity in its tank, 1,000 gallons, and the same normal coal supply, 25 cwt.

The Japanese locomotive, the material for which was imported but machined in Japan, cost £1,349. The British non-compound radial tank locomotive cost £1,550 free on board in an English port. Freight, insurance and other charges brought the cost to £1,712 on board the Kobe. The cost of landing was 30s., and if 5 per cent. import duty be also added, the total cost at the Kobe, where the Japanese locomotive was built, works out to £1,792. The weight per train, including locomotive, in the case of the Japanese engine averages 122 tons, and the British engine 118.6 tons. The coal consumption per engine mile with this load was 22.22 pounds for the Japanese and 24.81 pounds for the British locomotive—a saving for former of 10½ per cent. due largely, of course, to the adoption in the Japanese engine of the compound system.

Compound Mineral Engine—London & North Western Railway.

A type of compound locomotive now running on the London and North Western Railway, where it is used principally for working the heavy mineral traffic over the South Wales district, is illustrated and described in a recent issue of *Engineering*. The first of this class was built at the company's works, Crewe, in 1893, from the designs of Mr. F. W. Webb.

In April, 1894, exhaustive trials were made with this engine and a non-compound, built on exactly the same lines, to test the advantages and suitability of compound *vs.* non-compound locomotives for working mineral and ordinary goods traffic. The working of the compound engine proved so satisfactory that nine of the same class have since been built.

All the cylinders operate on one axle, the second from the front. The two high-pressure cylinders are connected to crankpins in the wheels, set at right angles to each other, the low-pressure cylinder being connected to a center crank set at an angle of 135 degrees with the high-pressure cranks. All the cylinders are bolted together and in line, the low-pressure being placed immediately under the smokebox and the high-pressure cylinders on each side outside the frames, the steam chests being within the frames. The slide valves of the high-pressure cylinders are worked by the ordinary link.

The following table gives the general dimensions of these engines:

Cylinders:	
High-pressure (two)	15 in. in dia. by 24 in. stroke.
Low-pressure (one)	30 in. in dia. by 24 in. stroke.
Frames (steel, 1 in. thick):	ft. in.
Distance between frames	4 2
Length of framing over buffer-plates	30 2½
Wheels:	
Diameter with 3-in. tires	4 5½
Distance between centers of wheels	5 9
Total wheel base	17 3
Boiler:	
Length of barrel	15 6
" firebox casing	6 10
Mean diameter of barrel (outside)	4 3
Number of tubes	210
Diameter of tubes outside	1⅞ in.
Distance between tubeplates	13 ft. 4 in.
Heating Surface:	
Firebox	114.7 sq. ft.
Tubes	1,374.3 "
Total	1,489.0 "
Grate area	20.5 "
Ratio of firegrate area to heating surface	1 to 72.6
Boiler pressure	175 lb. per sq. in

Electric Motors.

The substitution of electric motors for steam locomotives on short lines of railway, experimented with during the past summer, seems likely to be encouraged by railway companies having lines which have been rendered unprofitable by the competition of trolley lines. This is shown by the fact that the Baldwin Locomotive Works have orders for light weight electric trucks for several motor cars capable of hauling two passenger cars to run at high speed.

The electric equipment of the motor is designed and constructed by the Westinghouse Company, the trucks and car being made by the Baldwin Locomotive Works. There is at present much engineering talent employed in the development of the motor car, and the experience of the last few months has suggested many changes in construction. This is especially true of electric motors for freight service. The one built by the Baldwin Works for the North American Company, by order of Mr. Villard, has never gone into actual service on account of the change of management of that company. It has been run only experimentally. It was built from plans supplied by the purchasers, and was similar in design to the locomotive built by the General Electric Company for switching purposes at Baltimore, which is now in daily service.

The principal feature in the design which is disapproved by the Baldwin Locomotive Works, and which is radically changed in the motors now being constructed, is that the armature of the motor was concentric with the axle of the truck, the motor field magnets surrounding it, and also resting upon the axle. This great weight, undistributed, soon produced serious wear of the axle bearings, and the bad effects were shown on the track. In the present method of construction fully one-half the weight of the motors is hung upon the iron frame of the car, the armature being parallel to the axle instead of upon it.

The freight motors are built to haul 600 or 800 tons, while the motors for passenger trains have a capacity of about 200 tons. The Baldwin people are now building an electric freight motor which is to be used by the Westinghouse Electric and Manufacturing Company for switching purposes in its freight yard near Pittsburgh, and for exhibition purposes. With present experience it is not considered probable that any experiment will soon be made with electric freight motors except for the purposes above indicated. The direction which the development is likely to take is the handling of freight trains within city limits from the freight yards to the various points of distribution. A trolley system would not be practicable for this purpose.

Quite recently Mr. Westinghouse has expressed the opinion that, under patents controlled by his company, the electric current can be conveyed to the motor without the use of a trolley wire or a conduit and slot. He also believes it to be not only practicable but economical to operate long lines by electricity. An alternating current of high voltage would be used for distribution, which would be converted into a continuous current for operating the motors. This in itself would not secure economy over steam, but he says he is satisfied that he can produce electricity at one-sixth the present cost of production. He expects to make his method public within a few months.

What Becomes of Horses.

When a locomotive has outlived its usefulness, and is finally condemned to the scrap pile, the event is simply the beginning of a new life for many of its parts, which are cast and forged into new articles for various purposes. But the iron horse is not so badly treated as its flesh and blood prototype after its life's work is done. It is said that a concern in Philadelphia makes a profit of $24 on the carcass of every horse. In the first place, the hide is valuable, and the leather known as cordovan is taken from the skin over the rump. The other leather is soft, and is used mostly for slippers and heavy driving gloves. The hair from the tail and mane is made into haircloth, and the short hair is used in stuffing cushions and horse collars. From the hoofs oil is extracted, and the horny substance is sold to comb manufacturers. The leg bones are used for knife handles. The ribs and head are burned to make boneblack after the glue has been extracted. By various processes phosphorus, carbonate of ammonia, cyanide of potassium and prussic acid are obtained, and sometimes the meat is canned and shipped to Europe.

Railroad Business in the Northwest.

President Roswell Miller, of the Chicago, Milwauke & St. Paul Railway, while in New York recently said:

"Railroad business in the Northwest is good. Earnings will continue to increase. The larger part of the improvement in the St. Paul's earnings comes from grain. While the export movement of wheat is not large, there is a heavy consumption of this cereal by millers, and the elevators are being filled. The merchandise traffic from the jobbing centers is greater than it was last year. The outlook for business for the St. Paul in the calendar year 1896 is excellent. It will certainly equal 1894, and probably 1893. What is true of the St. Paul is true of the other roads in the Northwest. The best year the St. Paul ever experienced was 1892. While the farmers are getting low prices for their grain, they are vastly better off than they were last year, for then in many sections they had no crops at all. Some corn will go forward in December, and the movement of this cereal will be well under way by Jan. 1. Low prices for grain make no difference in the rates for carrying it. If the rate is lowered two or five cents a hundred a similar amount is taken off the market price, so that the farmer derives no benefit. There is no truth in the report that the St. Paul intends to acquire the Iowa Central. It has no extensions or acquisitions in view."

A New Road Through Jersey City.

The Lehigh Valley Railroad, which reaches its large terminal freight yard and docks in Jersey City over the tracks of the National Docks Railroad, has determined to build two and a half miles of road through that city so as to reach its yards and docks over its own tracks. To that end the Hudson & Greenville Railroad Company, with a capital of $200.000, has been chartered under the laws of New Jersey, and the work of constructing the connecting link, which has already been located and the right of way secured, will be pushed forward as rapidly as possible. The new road will run from Greenville, where the tracks of the Lehigh Valley Terminal Railway connect with the National Docks Railway, almost paralleling the National Docks tracks, to Communipaw, where the connection with the Lehigh Valley's tracks to the freight yard and docks will be made.

Green as an Emblem of Ambition.

A story is told about President Chauncey M. Depew of the New York Central Railroad, that is considered as conclusive evidence of his ambition to become President of the United States. It is the outcome of a recent tour of inspection of the Vanderbilt lines. Mr. Depew's private car is well known along the line of the Vanderbilt roads. It has no name, but is designated as "No. 100, Official." The men along the road, however, call it Old Hundred.

Red instead of green flags have heretofore been used on the rear of this car for "markers." This trip the red flags gave way to the conventional green ones, and as the train pulled out a son of Erin, who noticed the change in the color of flags, said to a companion: "Do yez moind thot, Moike? The prisidint is out in polytics, shure. He do be making a bid for the Oirish vote wid them flags."

Personal.

Mr. F. C. Prest has been appointed Purchasing Agent of the Northern Pacific.

Mr. Henry Fink was on Nov. 14 appointed Receiver of the Norfolk & Western Railroad.

Mr. F. M. Drake, who was elected on Nov. 5 Governor of Iowa, is President of the Indiana, Illinois & Iowa Railroad.

Mr. B. F. Bush has been appointed General Superintendent of the Oregon Improvement Co., with office at Seattle, Wash.

Mr. J. F. Sechler has been appointed Master Mechanic of the Louisville, Evansvile & St. Louis, with headquarters at Princeton, Ind.

Mr. E. E. Stoup has been appointed General Superintendent of the Gulf & Interstate Railway, with headquarters at Beaumont, Tex.

Mr. F. N. Hibbitts, Master Mechanic of the Rochester division of the Erie Railroad, has been appointed Train Master of the Eastern division.

Mr. Henry Wood has been appointed Acting Manager of the Choctaw, Oklahoma & Gulf Railroad, with headquarters at South McAlester, I. T.

Mr. W. E. Looney has been appointed Master Car Builder of the Louisville, Evansville & St. Louis, with headquarters at Princeton, Ind.

Mr. James R. Shaler, formerly Superintendent of the Chattanooga Union Railway since 1891, has been appointed Superintendent of the Panama Railroad.

Mr. F. W. Mast has been appointed Master Mechanic of the Lehigh & Hudson River road, with office at Warwick, N. Y., vice Mr. H. M. Messimer, resigned.

Mr. J. K. Lape has resigned as Superintendent of Motive Power of the Louisville, vansville & St. Louis Consolidated Railroad, and the position has been abolished.

Mr. F. W. Webb, Locomotive Superintendent of the London & North Western Railway, England, is said to be contemplating retirement from active service shortly.

Mr. J. F. Sheahan has been appointed Master Mechanic of the Florida Southern, Sanford & St. Petersburg railroads of the Plant System, with headquarters at Palatka, Fla.

Mr. L. C. Smith, formerly of the New York & New England road, has been appointed Superintendent of the Delaware, Susquehanna & Schuylkill road, vice Daniel Coxe, deceased.

Mr. E. B. Thomas, President and one of the Receivers of the New York, Lake Erie & Western Railroad, has been chosen President of the reorganized company, the Erie Railroad.

Mr. A. W. Swanitz, Chief Engineer of the New Orleans & Western Railroad, which is now under construction, has also been appointed General Manager, with office at New Orleans, La.

Mr. George S. King, the founder of the Cambria Iron Works in 1852, now 86 years of age, is said to be the oldest living ironmaster. He lives in Johnstown, Pa., and is in excellent health.

Mr. B. L. Olds, Purchasing Agent of the Union Pacific, Denver & Gulf Railway, has resigned, and the office is abolished. Its duties are assumed by General Superintendent T. F. Dunaway.

Mr. Henry G. Ashton, the inventor of the Ashton blow-back safety valves for locomotive boilers, and founder of the Ashton Valve Company, of Boston, Mass., died recently at his home in Somerville, Mass.

Mr. W. R. Setchel, formerly with the New York, Lake Erie & Western at Hornellsville, N. Y., has been appointed Assistant Master Mechanic of the Wheeling & Lake Erie, with headquarters at Massillon, O.

Mr. John Higginson, Master Car Builder of the Canadian Pacific Railway, has resigned. The position will be filled temporarily by Mr. George A. Eaton, formerly General Foreman of the car works at Hochelaga.

Mr. W. J. Atmur, Superintendent of the Harvey Steel Car & Repair Works at Harvey, Ill., has resigned that position to accept the General Superintendency of the Hegewisch plant of the United States Car Company.

Mr. Frank Toumey has been appointed Master Mechanic of the Rochester division of the Erie Railroad. He was formerly General Foreman of the company's shops at West Newburg, and held the position a number of years.

Mr. F. B. Smith has been appointed General Master Mechanic of the New York, New Haven & Hartford Railroad; and Mr. W. P. Appleyard has been appointed Master Car Builder. Both officers will report to the Superintendent of Motive Power.

Mr. Albert Griggs, formerly Superintendent of Motive Power of the New York & New England, and later Assistant Superintendent of Motive Power and Machinery of the Chicago & Eastern Illinois, has resigned, and the office has been abolished.

Mr. T. R. Brown, Assistant Master Mechanic of the Juniata shops of the Pennsylvania Railroad, at Altoona, Pa., has been appointed Master Mechanic of the same to succeed Mr. H. D. Gordon, whose resignation we announced last month.

Mr. C. G. Lunholum, General Foreman of the Wabash shops at Springfield, Ill., has resigned to become General Foreman of the Southern California Railway shops at San Bernardino, Cal. He is succeeded by Mr. L. H. Branch, formerly General Foreman at Tilton.

Mr. Jeff Lane has been appointed General Superintendent of the Georgia Southern & Florida. The office of General Manager, which was held by Mr. W. B. Sparks, the former Receiver, has been abolished, Mr. Sparks retiring from the service of the company.

Mr. E. P. Bryan, Superintendent of Terminals of the Louisville & Nashville, at St. Louis, is to be the new General Manager of the Terminal Railroad Association of St. Louis. He is to assume the duties of that office by Jan. 1, when Mr. Joseph Ramsay, Jr.. retires to become General Manager of the Wabash road, where he succeeds Mr. Charles M. Hayes, who goes to the Grand Trunk.

Mr. Paul Morton has been elected Third Vice-President of the Atchison, Topeka & Santa Fe. Mr. Morton was for many years General Passenger Agent of the Chicago, Burlington & Quincy, and later General Freight Agent. He has been Vice-President of the Colorado Fuel & Iron Company for the last five years. He is a son of the Hon. J. Sterling Morton, Secretary of Agriculture. Mr. Morton is a young, pushing, energetic and progressive man, and his services will prove highly valuable to the Atchison Company.

Mr. Edward Payson Ripley, formerly General Manager of the Chicago, Burlington & Quincy Railroad, and for the past five years Third Vice-President of the Chicago, Milwaukee & St. Paul Railway, has been elected President of the reorganized Atchison, Topeka & Santa Fe Railroad. Mr. Ripley was born in Dorchester, Mass., Oct. 30, 1845, and began railroad service in 1868. His work has been nearly altogether in the traffic departments of the Burlington and Milwaukee roads, being at the head of these altogether about fifteen years. He is a progressive, "broad gage" railroad man, and the greatly improved future of the Atchison road is assured by his selection as President.

The Shut-Eye Train,

Come, my little one, with me!
There are wondrous sights to see
As the evening shadows fall;
In your pretty cap and gown,
Don't detain
The Shut-Eye train—
"Ting-a-ling!" the bell it goeth,
"Toot-toot!" the whistle bloweth,
And we hear the warning call:
"All aboard for Shut-Eye Town!"

Over hill and over plain
Soon will speed the Shut-Eye train!
Through the blue where bloom the stars
And the Mother Moon looks down
We'll away
To land of Fay—
O, the sights that we shall see there!
Come, my little one, with me there!
'Tis a goodly train of cars—
All aboard for Shut-Eye Town.

Heavy are your eyes, my sweet,
Weary are your little feet—
Nestle closer up to me
In your pretty cap and gown;
Don't detain
The Shut-Eye Train!
"Ting-a-ling!" the bell it goeth,
"Toot-toot!" the whistle bloweth
O, the sights that we shall see!
All aboard for Shut-Eye Town!

—*Eugene Field.*

Southern & Southwestern Railway Club.

The regular meeting of the Southern and Southwestern Railway Club, was held in Atlanta, Ga., November 21. The subjects for discussion were: "Best sizes of pipes and connections for radiating results of the Baker heater; best liquid to be used." Messrs. J. M. Holt and T. S. Lloyd, committee. "Present state of art of kindling locomotive fires with oils." Messrs. W. L. Tracy, P. H. Schreiber, and E. T. Silvius, committee. "The best and most accessible plan for applying air brakes to hopper gondola cars having straight chutes." Mr. A. B. Corinth, and W. H. H. Price, committee. "A durable and cheap round-house floor." Messrs. J. T. Robinson, and J. G. Tomlinson, committee. "Inspector's gage to determine the height of drawbars." Committee, Messrs. Jas. Bossenger and Jas. Maglenn.

Plant System at the Atlanta Exposition.

In our last issue we published a brief description of the Cotton States and International Exposition, and mentioned therein the chief features of the exhibit of the Plant System. The accompanying engraving is a photo-reproduction of the building erected by this system, and which is one of the most attractive on the grounds. As the engraving shows, it is in the form of a pyramid, the sides being covered with varieties of phosphate rock found along the lines of the system. Its effect by electric light is very beautiful.

October 27 was the 76th anniversary of President Henry B. Plant's birthday, and about 3,000 employees of the system assembled at the Exposition grounds that day, to celebrate the event. Mr. Plant was present, and in response to the welcoming speeches of the President of the Exposition and of the Mayor of Atlanta, said that he was very grateful for the kind demonstrations of his many friends. He seized the occasion to impress upon the officers and employees of the Plant System the important fact that a great railroad's highest success is only possible of attainment through the excellence of its service and the considerate treatment of its patrons, its connecting lines and the public at large; and he administered an exceedingly valuable lesson in manners to his employees when he said:

"But we would have you recollect that we are the servants of the people who are our patrons, to the extent that we must treat their property while in our possession with all the care we would our own. We must be careful of our manners, our speech; we must see to it that no patron of the Plant System ever comes to an employee and asks information without getting it to the fullest."

Plant System Building, Atlanta Exposition.

A resolution was adopted by the employees of the system present, providing that hereafter Oct. 27 shall be celebrated by the employees of the Plant System in honor of its distinguished president.

Western Railway Club.

This club held its regular meeting Nov. 19, at the Auditorium Hotel, Chicago. There was a discussion on "Wide Fire Boxes," based upon Mr. J. Snowden Bell's paper, presented at the October meeting. Also a topical discussion on "Freight Car Doors and Attachments." The paper of the day was entitled: "Air Brakes on Freight Equipment," by Mr. A. M. Waitt, General Master Car Builder of the Lake Shore & Michigan Southern Railway.

An Error.

In our last issue, in describing the new Lehigh Valley passenger engine on page 164, it was stated that the weight carried on the four drivers is 90,000, and that the weight per driving-wheel journal is 24,000 pounds. The former statement is correct and the latter wrong. The weight transmitted to the rail by each driver is 22,500 pounds, and the weight per driving-wheel journal is about 20,000 pounds.

Commercial Agent T. E. Moore has made a report to the Department of State on European railroads and railroad speed. Russia built the greatest number of miles of new railroad during the year—678 miles; England the least—224 miles. The average rate of speed per hour for fast express trains was: England, 51.75 miles; Germany, 51.25 miles; France, 49.88 miles; Belgium, 45.04 miles; Holland, 44.73 miles; Italy, 42.34 miles, and Austria-Hungary, 41.75 miles.

The Phœnix (Ariz.) *Herald* says that the value of the entire copper product of the Territory for the last fiscal year will not fall short of $20,000,000, and would have exceeded that figure had not one of the great copper camps been closed down awaiting the completion of a railroad which will enable its product to be marketed at reduced cost. One single mine, it is alleged, turned out over 40,000 tons of copper during the last fiscal year, worth, at 11 cents a pound, $8,800,000. The development of this industry has placed Arizona next to Michigan as a copper-producing region, Montana occupying the first rank.

A Train Wreck in a Paris Depot.

Late in October a passeng train on the Western Railway of France entered the aris depot, the Montparnasse Station, so rapidly that it could not be stopped, and dashed through the buffers at the end of the track, and through the walls of the depot to the street 33 feet below. A considerable portion of Paris is built in a valley, and for this reason some of the principal railways arrive at their terminal stations on a level considerably higher than that of the surrounding streets. The only serious personal injury resulting was the death of a woman in the street caused by a falling stone.

Our London contemporary, *Engineering*, gives in a recent issue many of the detailed facts of the accident and

THROUGH THE DEPOT.

a photo-engraving of the engine as it appeared shortly after. We reproduce the engraving herewith, on a diminished scale, and it reproduces the curious result of this remarkable accident in every detail. In describing the accident our contemporary says:

The station staff was terrified at seeing the train enter the shed at a speed of at least 30 miles an hour. Before there was time to realize that an accident was inevitable, the locomotive had dashed into the fixed buffers, of which, with the framing, but few traces could be found after the accident; then, mounting the end platform, which it crossed, the engine struck the wall beneath the large arched windows of the facade; this wall is 6 feet 6 inches high and 31 inches thick. So far from this arresting the engine, a large gap was driven through it, wrecking the window above, in the manner shown in the engraving. Then traversing the broad terrace already referred to, and breaking up the masonry floor in its course, the locomotive was hurled against the heavy stone balustrade; about 30 feet of this was torn down and thrown into the street, some of the masses of masonry thus broken being projected 40 feet or 50 feet into the Place in front of the station. Meanwhile the train with its passengers was following the engine in its wild career, and the latter, having no further obstacle to retard it, fell into the street at an angle of about 60 degrees. Where it struck the pavement an indentation of some 26 inches in depth was made, and at last the engine remained quiescent, resting in front on the pavement, and at the rear against the wall, connected to the tender, which hung in an almost vertical position; the tender in its turn remained attached to the guard's van; the remainder of the train stopped on the end platform in the station, and on the rails. The safety valves of the boiler had been forced open, and the steam dome ruptured at an earlier stage of the proceedings, but no damage from escaping steam was done.

Both the driver and fireman were absolute in their statement that the Westinghouse brake with which the train was fitted, worked as usual until it had arrived within a few hundred yards of the station, when they suddenly found that the brake refused to act. The train was then approaching the station at a relatively high speed; they reversed their engine and whistled the "brakes on" signal; but they failed to give any explanation as to why the brakes suddenly refused to act, or why, if there was a rupture in the brake pipes, the brake did not go on and check the train, the automatic system being in use. Moreover, after the accident, the brakes on the guard's van and two other vehicles which had mounted the end platform, were carefully tested, and were found to work perfectly, despite the strain to which they had been subjected. The railway servants on the train are unanimous in declaring they received no brake signal from the engine, and it was only when the guard found the train entering the station at nearly 30 miles an hour that he put on all the brakes, and by reason of their efficiency converted what would have been a shocking calamity into an alarming but grotesque incident. Not only does the testimony of the guard and other servants entirely contradict the asseveration of the driver and fireman, but the train—except, of course, the engine and tender, which were extensively damaged by the fall—disproves the truth of their statements. No other conclusion can be arrived at than that it was carelessness pure and simple that caused the accident.

It is probable that the high speed of the train lessened the severity of the accident, for if it had not been sufficient to sweep away the fixed buffers, the shock to the passengers must have been terrible. There are two important deductions to be made from the accident; first, that the most careful drivers are liable, from one cause or another, to acts of the wildest carelessness; and, second, that the Westinghouse automatic brake can be fully depended on to avert what may appear to be an inevitable catastrophe.

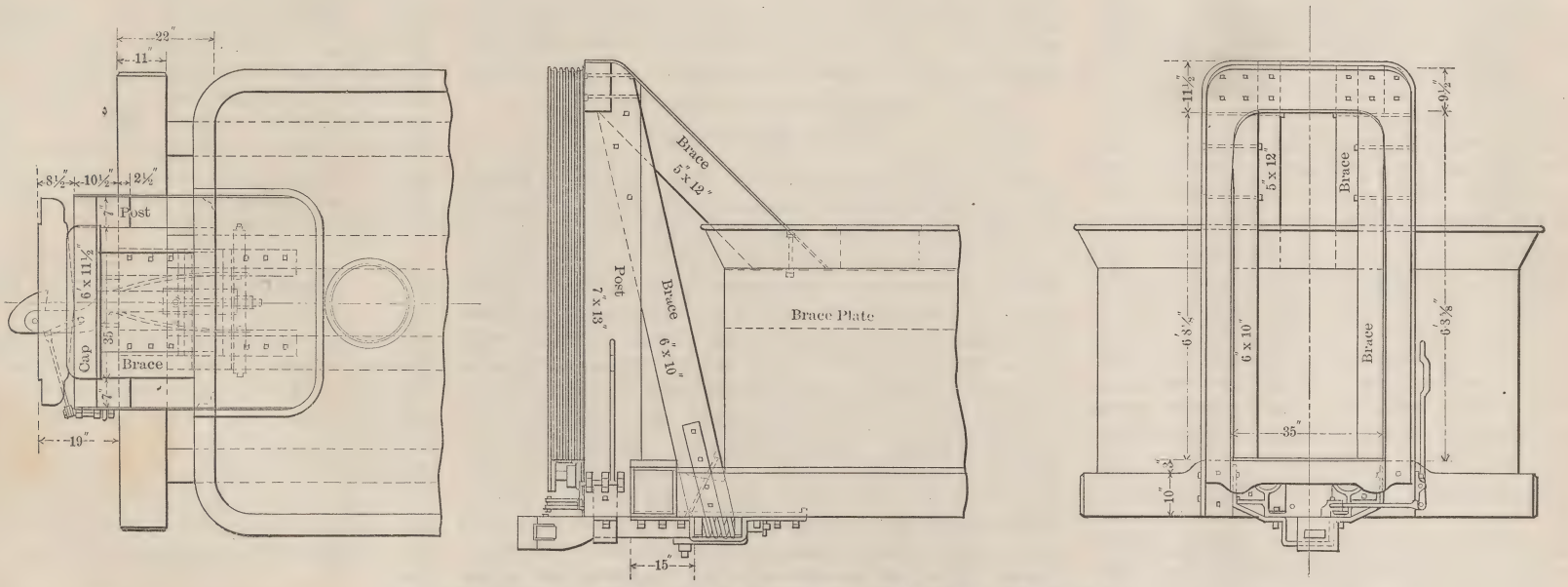
Lower Rates for Upper Berths.

Mr. James R. Wood, General Passenger Agent of the Pennsylvania Railroad, has started a movement that has for its object a reduction in the charges for upper berths in sleeping cars. It is stated that about two-thirds of the roads using Pullman sleepers and running into Chicago have joined the movement, and that the reduction insisted on is about 25 per cent. below the present rates, which are the same for both upper and lower berths.

Vestibule for a Locomotive Tender.

In our last issue (page 168) we published a short description and reproduced a photograph of a vestibuled locomotive tender in use in the United States railway mail service on the St. Louis Southwestern Railway, between Pine Bluff and Texarkana. Through the courtesy of Mr. R. M. Galbraith, General Master Mechanic of the road, we are enabled to present herewith drawings showing the general arrangement.

The frame that carries the vestibule is made of posts 7 by 13 inches in section and a cap 6 by 11½ inches. The posts are fitted at the bottom to the end sill, and are braced by two pairs of diagonals. One pair 6 by 10 inches in section, extends down to the center sills between the back of the tank and the end sill; the other pair, 5 by 12 inches in section, go to the top of the tank. The coupler is of the Miller hook type, but with a swing head, and is attached to a special draft gear. The vestibule plates are set out by Gould buffers. The top of the vestibule is covered with sheet iron.



VESTIBULE ARRANGEMENT FOR LOCOMOTIVE TENDERS.

New England Railroad Club.

The time for holding the regular meetings of this club has been changed to the second Tuesday evening at 8 o'clock of the months the club meets, namely: January, February, March, April, May, September, October, November and December.

Master Mechanics' Association Circular.

Slide Valves.

The Committee on the above named subject has issued the following circular:

The Master Mechanics' Association having appointed the undersigned a Committee "To consider different types of balanced valves, their economy and efficiency over plain unbalanced slide valves, and what difference in economy and efficiency (if any) would result if foregoing types of valves were provided with the Allen port," we would be obliged if you would promptly answer the following questions and return to G. R. Henderson, Mechanical Engineer, Norfolk & Western Railroad, Roanoke, Va.:

What is the total number of locomotives on your road?

How many of these locomotives have balanced valves?

What type or types of balanced valves are used on these locomotives, and if more than one type, how many of each variety?

In what class of service do you use balanced valves?

What per cent. of the total valve area do you balance on such valves, and what is your rule for the balanced area?

What is the wear of seats and valves per unit of distance in miles on balanced and plain valves?

What is the comparative wear on link motion from balanced and plain valves?

Give the results of your experience with balanced valves.

Have you in use any piston valves, and if so, on how many locomotives?

Give the results of your experience with piston valves.

How many locomotives have you with Allen ported valves?

Are these Allen valves balanced or unbalanced?

What discrimination do you make in the service for Allen valves and plain valves?

Give the results of your experience with Allen valves?

G. R. Henderson, W. H. Thomas, E. E. Davis, Philip Wallis, L. R. Pomeroy, Committee.

American Society of Mechanical Engineers.

The sixteenth annual meeting of this society will be held at its house, 12 West Thirty-first street, in New York City, December 3d to 6th. The convention will be opened at 9 P. M. on Tuesday evening by being called to order to discuss topical questions as follows:

For filtering oil having very finely divided metallic particles in suspension, what have you found to be the best filtering material, either for one operation or in a series?

What information can you give as to the best method for the extraction of oil from condensed steam, where it is desirable to use the exhaust steam repeatedly for boiler feed purposes?

What is the economy, if any, of damper regulation in firing with liquid or gaseous fuel?

In boilers fired with liquid or gaseous fuel, is there any advantage in simultaneous regulation of the fuel supply and the position of the damper, either by the same or by different mechanisms under the ordinary control of the steam pressure?

Are there any conditions under which oil fuel is cheaper than coal for generating steam at points in the Atlantic Sea board States; if so, what are they, and where?

The professionel papers that will be read during the meetings are as follows:

CARPENTER, R. C.: Effect of Temperature on the Strength of Wrought Iron and Steel.

CHAMBERLAIN, P. M.: Some Data Relating to Forge Shop Design.

JACOBUS, D. S.: Experimental Method of Determining the Effective Centre of the Light Emitted from a Standard Photometric Burner.

BARR, JNO. H.: The Proportions of High Speed Engines.

EMERY, C. E.: Means adopted for Saving Oil in a Large Oil Refinery.

DENTON, JAS. E.: The Reliability of Throttling Calorimeters.

GOUBERT, A. A. & PEABODY, E. H.: Some Experiments with the Throttling Calorimeter.

EMERY, C. E.: Comparative Tests of Steam Boilers with different kinds of Coal.

KINGSBURY, ALBERT: Experiments on the Friction of Screws.

GOSS, W. F. M.: Tests of a 10 H. P. De Laval Steam Turbine.

BISSELL, GEO. W.: Recording Device for Testing Machines.

Communications.

Larger Freight Cars.

Editor National Car and Locomotive Builder:

I have read with great interest the article in your last issue under the heading "Larger Freight Cars," because it calls back to my recollection an incident of eight years ago at the Master Car Builders' Convention. A model three-truck car was being examined by a number of Master Car Builders, and in discussing the use of such an appliance between themselves, some ridiculed the idea of a greater capacity car than the 60,000-lb. car ever coming into general use; others reverted to the changes in car and engine capacity in the past 10 years, and they expressed an opinion that the monster 20-inch cylinder engines that were now coming into use would haul such long trains that these trains would pull themselves into pieces, so that in the near future this would suggest a still further change in car capacity so as to shorten trains, and when that time comes then some such a system of car construction as presented would claim the attention of railroad officials, but at present the invention is ahead of the times.

I will now discuss the views presented in the article from a practical view of the past. It seems now that another change is close at hand—long trains have proved destructive to themselves, and the capacity of the engine will be reached in the near future by the concentration of such freight in less cars as can be concentrated, such as ore, grain and meat. Then other savings will follow, such as reduced switching improved and track and terminal facilities. Now, to increase the capacity for hauling this concentrated tonnage, a well-designed 60,000-pound car frame can be made capable of so doing by simply putting a center support-truck under the car in proper shape. As a proof of this, in 1885 the Fort Smith Railway Company had 35 weak cars, some 28 and some 30 feet long. The cars were in good condition, but not safe to load above 24,000 or 30,000 pounds of coal. The company could not afford to haul these cars in such service, and, being poor, could not afford to throw them away; so they put a center-truck under them and raised the sides and ends, and made 40,000-pound capacity cars of them. These cars gave good satisfaction. A few years later the Missouri Pacific Railway Company got possession of the road, and these cars were transferred north to service between the granite quarries and St. Louis. They are in this service to this day. They must be well satisfied with the service of this system of car construction, for I notice these cars are occasionally rebuilt, with the third truck still kept under them.

So the center support is no longer an experiment; the Pennsylvania Railroad had 113 three-truck cars in service five years ago, hauling from 80 to 120,000 pounds of ore to their dumps; and the Lake Shore & Michigan Southern 50 cars in service six years ago. All these companies reported them giving good satisfaction in the service they were in. I have seen the three-truck car system worked in mixed freight and passenger trains for five years. The reason this system was used was to increase the hauling capacity in freight and shorten the train. The grades being very heavy and there being many sharp curves, the company found it very profitable to use the three-truck system under these conditions.

Now, Mr. Editor, when we raised the capacity of cars from 20-30-40 to 60,000 pounds, the weight of the car body as well as trucks had to be increased; and now the body is loaded down with supporting irons. The truck had to be strengthened to carry this accumulation, for all the weight has finally to fall on to the truck bolster before it reaches the rail, the 60,000 pound car throwing a static load of 45,000 pounds on the rail at each end of the car. It seems to me that our modern engineering would suggest some other way to support the car body and its load than to still continue loading it down with iron. To my point of view this should be avoided as much as possible now that the weight of the body to the load has reached such proportions, and if we continue the use of timber in car construction the only feasible way to reach this is to support the body more directly from the rail with a center support, thus making two spans instead of one as the car is now. Then the additional weight now under consideration in the 80,000 pound car would be distributed over three trucks and over more points of the rail, which is an important point in view, and well worthy of consideration by all railroad experts and officials.

T. FINLAY.

LITTLE ROCK, Ark.

Excessive Lead and Inside Lap.

An intelligent locomotive engineer, and—though still a young man—of over 12 years' experience in running locomotives, is employed on a railroad that has recently been equipping its engines with close notched quadrants in place of the old style wide-notched quadrants, the purpose being to save fuel. As a consequence, the engines are being run with shorter cut-offs than formerly and with more liberal throttle opening. As a further consequence, this engineer writes to us as follows:

Editor National Car and Locomotive Builder:

The article in your October number from Mr. Sealy, on valve lead, strikes me very forcibly as I have been of the opinion for some time that the fine notch quadrant is a dead giveaway to excessive lead and inside lap; and I believe an engine properly handled will make the best showing that is not cushioned too much. Furthermore, numerous parts of her machinery will have less severe strains.

Experience has taught me that where too much inside lap is used along with excessive lead, the fine notch quadrant and vigilant engineer cannot fulfill their mission.

Excessive Valve Lead Expensive.

Editor National Car and Locomotive Builder:

Having read the very interesting and able article on "Valve Lead," by Mr. C. H. Quereau, in the September issue of the NATIONAL CAR AND LOCOMOTIVE BUILDER, I was hopeful that this important subject would receive further attention from locomotive men and others. Looking at the matter from an engineer's standpoint, I do not believe that a locomotive is benefited by "lead" in the extreme or full gear positions. The fact is that most engines have too much lead at a six-inch cut-off (a common running cut-off point) with zero in the full gear positions, for either smooth performance or comfortable riding at high speeds.

As Mr. Quereau states, "the engine never runs so smoothly as when shut off." This goes without argument and proves that lead is the father of not only loose cylinders, hot pins, broken deck bolts, loose cabs and running boards, but has also much to do with that very uncomfortable performance known to engineers as "bucking," which is simply the retarding shocks to reciprocating parts caused by excessive lead in the running cut-off. Some engineers mistake this condition for imperfect counterbalancing and have their caunterbalance weights "tinkered" with. This generally aggravates the disease. Try a reduction of your lead, if possible. You will be gratified and the company benefited by the change.

Valve setting and lead are matters of a wide difference of opinion; recent speed tests, however, go to prove that lead is not required for high speed, and I think most enginemen will agree that the engine does not need it for smooth running. It is true there are some few master mechanics who still believe and insist that their respective ideas of sixteenths, tenths, eighths of an inch, etc., give just the proper amount of lead for the valves to have while in full gear, but we have their parallel in Engineer Jones, who oils around at every tank he stops at, because the man he fired for did it.

There are many enginemen who cannot be induced to operate their engines in the shortest cut-off with full throttle and consistent with the duty to be performed because, to use their words, "She bucks so badly when she gets to going." They will agree that the engine burns more coal with the less throttle and longer cut-off style of operation, but "the company buys the coal, and she don't make me so weary when I run that way."

Some day the indicator will come into common use. Valves will be corrected before they become so wasteful and the engine so lame that it is painful to listen to the exhausts; then the manager will rub his hands and say, "Why, we made a remarkable showing last year compared with previous years on fuel!"

LEAD.

Central Railway Club.

The regular meeting of this club was held in Buffalo Nov. 8, with President Higgins in the chair. A committee consisting of Messrs. John Mackenzie and A. C. Robson recommended that greater attention be given by railroad officers to correcting the stenciled light weight of freight cars. The report said: "With the fact staring us in the face that a large percentage of the cars are running with excess weight stenciled upon them, railroad companies must see the loss to them and the gain to the shippers."

There was some discussion about the steam heating of passenger trains. The use of a steam trap Mr. Waitt did not think was either necessary or advisable. Automatic devices were not to be relied upon in all kinds of weather without some one to adjust them. They had been tried with unsatisfactory results on the Lake Shore and abandoned. The only trouble ever had with drip valves was with those having a V slot.

Mr. Nelson gave a comprehensive description of the double return system in service on the Pennsylvania in which no traps are used. The rule for pressure is from two to three pounds per car.

Mr. Mackenzie said it was important that all pipes should be thoroughly blown out before letting in hot steam. The steam was sluggish in its movement and this was due to water in the pipes. When the pipes are blown out before coupling up a car is at once ready for heating, and the requisite heat can be at once secured with a less amount of steam.

Mr. Chubb, of the Michigan Central, said they had found drip valves successful, if trainmen followed instructions. They do not always do this, and the chief trouble experienced from the freezing of valves has been due to the carelessness of employees. Difficulty has been experienced in blowing out pipes. Mr. Chubb believed that train crews should have charge of the apparatus and be held responsible for its care and management.

Mr. Waitt said that on the Lake Shore the three-way cock on the rear car is opened before reaching a terminal, and left open for examination by the inspectors. This is done five minutes before arriving at the terminal, and within 500 feet of the station the engineer shuts off steam. Trainmen are held responsible for the management of the apparatus.

President Higgins did not think there was any question as to the wisdom of the trainmen having full control of the steam heat. The Lehigh Valley had tried the experiment of allowing the porters to handle it in the sleeping cars, but the results were so unsatisfactory, that the former method was restored.

The next subject discussed was the "proper method to bring drawbars to their right height, and the form of gage to determine the actual height of drawbars on cars in service."

Mr. Waitt described the practice on the Lake Shore, and laid great stress upon the importance of exercising great care in making measurements, which, he said, should be taken at different points on the track. In building new cars or rebuilding old ones, the practice is to place them at 34½ inches.

Mr. Bronner was of the opinion that some form of gage would have to be devised in order to obviate trouble in the future that would otherwise be inevitable.

Mr. Higgins said that there appeared to be confusion among men of high standing in the mechanical world as to what the law really means. Opinions varied as to the height of drawbars, and unless the matter was straightened out it was going to make trouble. The interpretation of the law had been left to the M. C. B. Association, and the Central in common with all other railway clubs should call upon the Association to give such interpretation within 30 days.

The committee on Safe-ending of Boiler Tubes was granted further time in which to prepare a report.

Progress in Aerial Navigation.

A French mathematician once assumed to prove that the goose exerted two hundred horse power in flight. This was reduced by later demonstrations (?) to fifty, ten, and one horse power; and at present mathematicians are ready to show that only one-tenth horse power is required—an advancement of two hundred thousand per cent. in favor of human flight!

It seems paradoxical that large birds attain such speed and rise with so little exertion, yet a host of careful naturalists assert it. To everyone dwelling where such birds abound the truth is well apparent. They are seen to flap when leaving the earth or when there is no wind, but once aloft the soaring bird remains with motionless wings for hours, and, describing great spirals, rises to a height of two or three thousand feet, changing only the slope of the wings and, direction of gliding. It is a problem of bird flight on which much has been written and little of value, but the complete key, though foreseen by Lord Rayleigh, is finally given by Langley through physical experiments, in which he excels.

The explanation is found in the internal work of the wind. Wind is not, as commonly supposed, a mass of air in motion; it consist of waves and eddies—small portions with unsuspected irregularities of speed. A bird has only to utilize these gushes and a part of its potential energy to gain in speed and height. When it is considered that the air has an increasing velocity as we ascend and a constant upward trend, especially over hills and ridges, the progress of a soaring bird against the wind appears more credible.
—*Yale Scientific Monthly.*

Baltimore & Ohio Annual Report.

The sixty-ninth annual meeting of the Baltimore & Ohio Railroad Company was held in Baltimore Nov. 18. A comparison of the 12 months ended June 30, 1895, with the year ended June 30, 1894, shows an increase in net earnings of $74,165, or 1.07 per cent.; increase in earnings from freight, $1,674,586, or 12.03 per cent.; decrease in earnings from passengers, $1,381,961, or 21.49 per cent.; increase in tons moved, 2,723,248, or 20.39 per cent.; decrease in passengers carried, 1,419,320, or 14.74 cent.

The report adds that the decrease in passenger revenue is because the greater part of the large earnings from the World's Fair travel accrued to the former year. The demoralization in freight rates is commented on and deplored. The aggregate expenditures for construction and betterments for the 12 months were 641,306, a decrease of $509,284 as compared with the previous 12 months. For maintenance of way and structures $2,846,232 was expended, and for maintenance of equipment $2,092,716. The roadbed of the entire system is reported to have never heretofore been in the superior condition in which it is at present.

Regarding the attempt of Mr. J. J. Hill to secure a consolidation of the Great Northern road with the Northern Pacific. The Minneapolis *Times* says that the Great Northern, in its answer in the Pearsall and Childs case confesses that unless a consolidation or some traffic arrangement is made with the Northern Pacific, it must build 400 miles of road to reach Tacoma, Portland and other points. This would involve an outlay of $10,000,000.

Selection and Treatment of Railroad Employees.

At the last meeting of the American Society of Railroad Superintendents in New York, the following report on "Railroads and their Employes" was read by Mr. C. R. Fitch, the chairman of the committee that had considered the matter. It is worthy of the careful perusal of every railroad officer:

The foundation for the best relationship between railroad corporations and their employees is to be laid when the men are selected. Upon this much depends. "It is the bridge with the weak foundation that goes down with the spring freshet." Unless care and discrimination are exercised in the selection of the beginners, it would be idle to expect the best results in practice. It seems to be the consensus of opinion of our correspondents, and in this your committee joins, that the best service may be expected from young men not heretofore in railroad employment, who have grown up on the respective lines of road, each working with his home in sight and bound to the employing road by strong local ties. The boys who have grown up along a railway line are not as a rule altogether ignorant with regard to the manner in which train work is done; but even if they are, such ignorance is but a temporary difficulty, soon cured, and they are altogether likely, for the reasons stated, to to give more faithful service than can be obtained from a transient or shifting class.

There is no training for railroad work better than experience. A brakeman receives the training in the duties of practical railroading that should make him an efficient and capable flagman. For the position of conductor, clearheadedness is an indispensable requisite. It is a natural gift, soon evidenced in some trainmen and always lacking in others. If to this is added that measure of executive ability which secures from his crew respect and obedience, a thoroughly good conductor is the result. Different but equally valuable qualities, largely natural, but partly acquired, are essential to the locomotive engineer. Along the various stages of progress, the unfit or unworthy may or should drop out, until upon a well regulated railroad, the conductors and engineers should be, and generally are, a picked body of intelligent men, well equipped for the responsibilities of their peculiarly onerous and exacting positions.

Not seniority, but character, intelligence and technical skill or knowledge, should be the governing considerations in making promotions. But seniority should be given all the weight to which it is entitled, other things being equal—that is, in deciding between the claims to promotion of two men of equal merit, the senior should invariably be preferred, if for no other reason than to place in this way a check upon mere favoritism on the part of the appointing power. Those of us in authority should be on guard against ourselves.

No general rule can be laid down for official supervision of employees; a superintendent, to properly fill his place, must keep thoroughly in touch with all of the affairs of his road or division, not only using members of his staff for this purpose, but drawing on every other source at his command, and among other resources by the encouragement of communications from the men. Every employee in the service, no matter how humble his position, should be made to thoroughly understand that any communication from him, whether oral or written, that bears upon the good of the service, is always in order.

Discipline should be strict, not harsh, and should be impartially administered. It is a very serious matter to dismiss a man from the service. The committee deplores a tendency to disregard humane practice in this respect. We believe that in administering discipline, it would be well to reduce, as far as possible, the number of suspensions from duty and the length of the same, and that disciplinary actions should be bulletined, avoiding the mentioning of names, but stating the action taken, and giving the reason why. A complete individual record should be kept, in which entries, both favorable and unfavorable, should be made, the same to be open at any time to the individual inspection of the party concerned. In cases of accumulated bad record, showing a succession of misdeeds, or in well proven cases of drunkenness, gambling, lying, gross negligence and insubordination, dismissal should follow. The men should be made to feel that as long as they do right their positions are secure, but that transgressions of the rules will be followed by disciplinary action. We believe that a conscientious treatment of this subject by those in authority, with pains taken in investigation, indicating a desire to know all the facts and to reach a just decision, will do much toward smoothing the rough edges of disciplinary proceedings.

Employees should be required to extend every possible civility to patrons, and this rule should apply to and be enforced in every department of the service.

We can hardly favor the giving of premiums for economy in the use of supplies, because it is not clear that they can be justly awarded, inasmuch as the conditions of service are so varying, but a system of awards for an absolutely clear record in train service during a given period, say of a year, such, for instance, as prevails upon the Fall Brook Railway, might be generally tested with possibly good results.

The committee is of the unanimous opinion that some system of "relief," to provide insurance, pensions, etc., is a valuable aid in strengthening the relations between the railroad and its employees. Such a plan, to be successful, should be not only sanctioned, but to a large extent be financially supported by the railroad company. Its accounts should be audited by the company's auditor, while it should be officered by prominent employees. Its membership should be voluntary, with such intelligent effort to make its advantages clear and manifest to every one, as will be likely to make membership well nigh universal. We look with favor upon any well-matured plan to provide for sick, injured and superannuated employees.

At each prominent terminal the railroad should make some provision for the comfort and recreation of its employees, and different kinds of technical training should be combined at such points under one roof. It might be under the auspices of the Railroad Branch of the Young Men's Christian Association or be in the nature of a club of railroad men, examples of which may be found at Cincinnati, and at Newark, O., which are proving successful. The members of the committee have visited some of these railroad clubs. They have been found to equal in appointments many social clubs of good repute, and they are supported willingly by a majority of the train and yard men in their respective vicinities. There can be no question as to their refining influence upon the men, who by their existence are deprived of plausible excuse to seek recreation at saloons. When men of the class of our American railroad workers are given a chance to improve themselves, they always take advantage of it.

The duty of operating officers in these matters, if well performed, will go far toward the solution of the problems which confront us. It is the small things which go to make up the sum of human existence. Painstaking, patient effort to intelligently consider the small grievances will prevent many of the larger ones. Be as mindful of the interests of your employees as you expect them to be of the interests of their companies, always remembering the fact that might never did, and never will, make right, and that those who are under orders are entitled to fair, honorable, manly treatment as long as their conduct entitles them to a place in the service.

Buffalo as a Railroad Center.

On the evening of Nov. 8 the Buffalo Club gave a dinner to Dr. Chauncey M. Depew, President of the New York Central & Hudson River Railroad, which must have been a pretty good spread, as it took three hours for the guests to conquer it. After a short introductory and exceedingly complimentary speech by the Mayor of Buffalo, Mr. Depew made one of his characteristic speeches, which we have pleasure in abstracting from as follows:

An occasion like this emphasizes the inadequacy of language to express sentiment. In a life fairly full of enjoyable happenings this greeting of yours is the most pleasant and interesting. Enmities accumulate with the natural competitions and strifes of a career and vendettas pass down through generations; but the accumulating forces of friendships begun early and growing stronger with the years, are as rare as they are delightful. For more than thirty-three years, which are counted a generation among men, I have been a frequent guest in your hospitable city, a speaker on controversial and patriotic topics, and, as general counsel and president of the great railway corporation which has its Western terminus within your limits, been brought in frequent contact and conflict with your authorities and citizens. It is a happy reminiscence and pleasant thought that private endearments have increased in number and cordiality, the public meeting, occurring almost annually, has become larger each year and kindlier to the speaker, and the questions so acute and irritating, which must necessarily arise between a growing city and its needs and a railroad company and its terminal necessities, have been met uniformly by the authorities of this city with a liberality and fairness which has kept the relations between Buffalo and the New York Central always friendly.

As a young law student, visiting my friend and your respected townsman, Mr. James Sweeney, in his then home of Tonawanda, I came up to deliver my first political speech at Buffalo. The question of the hour was Slavery and Secession, the one the highest moral issue a people ever had to deal with, the other the life or the death of the Republic. I have a lively recollection of that speech, my first in a city and to a great audience. I am afraid that it justified a criticism passed by an old lawyer upon it that it had more frills than shirt. It was certainly more lurid than logical, though the intensity of the feelings and passions of the hour made possible an enthusiastic reception for its declarations and declamation. I remember lying awake all night wondering whether the United States District Attorney would summon me before the grand jury to justify the charges that I had made against President Buchanan and his Cabinet, of conspiring for the overthrow of the Government in the interest of slave power. I had gathered my points entirely from the newspapers of Buffalo, and I was wondering where the newspapers got theirs, and fearing that the editors would fail to come to my defense. It was the only night of my life that I ever lay awake an hour on account of a political speech. The apprehensions of the Government moving in the matter were an illustration of that lack of a sense of proportion which is the defect of youth. Not always of youth. Some men are failures in politics, in the professions, in literature, and in business, because they never have learned to appreciate and understand the proportionate relations of themselves to the world or of the things that they are attempting to their own claims and expectations. The faculty of measuring one's place in the universe and in its daily events, in other words, a knowledge of proportion, is the hand-maiden of success.

Buffalo is a growth and not a boom. There is not a place in the country which has advanced more accurately upon the lines of development which are clearly American. I went through a city recently in the South which was an example of boom as against natural growth. There were streets and broad avenues, blocks of constructed business buildings, large plants built for the manufacturer to take possession of, streets of comfortable and cozy dwelling houses, public squares and parks, a belt railroad and a trolley line already constructed, and yet, beyond the capitalists who invested their money and the workmen, while the construction was going on, the place had never had an inhabitant and never will. It was built upon air and scenery. The commercial centers of the world, in their origin, have cared little for health or views. Many of them have been founded in the swamps when it has taken a century of effort to alleviate their malarial and miasmatic conditions. Their founding and their futures have been the solution, in their location, of the problems of transportation. For after all the civilizer of the world and the concentrating power of its wealth and activities is transportation. It is along the highways of commerce that prosperous empires have been founded and populous cities constructed. "All roads lead to Rome," was the commercial maxim of antiquity. "All roads lead to New York," is the commercial maxim of the new world, and Buffalo is the gate-way of New York.

While commerce and transportation have made the earth habitable and created kingdoms and cities, they have been from the dawn of history down to the commencement of the last half century the servants of kings. That is because militarism has always ruled the world, and commerce and transportation have looked for protection to the royal power which commanded the fleets and the armies, and therefore were the servants of the Throne. In our peaceful days commerce asserts its righteous prerogatives, and thrones, and cast, and privilege are dependent for their existence upon the bankers and the merchants and the manufacturers. They are the true nobility—noble not in the achievements of remote ancestors, but in their own success and in what those triumphs have contributed to the wealth and the power of their countries.

The foreigner who comes here and goes over our land concentrates his opinion in the single word "Bigness." But our bigness is one of the elements of our strength. It is not possible to conceive of a revolution dangerous to our existence or to the integrity of our institutions, or to the conservative safeguards of life and property, of which we are so proud, which will involve the republic. The Debbs revolution, with the Governors or States and the Mayors of cities in sympathy, was a remarkable test. Though it involved one-third of the States and one-half of the territories of the Union, yet with the Confederate veterans of the South eagerly proffering their services to the Government, and the sober sense of the New England and of the Middle States sustaining the President, the revolution was dissipated almost as quickly as it had originated, with the minimum of loss in either life or property. So in our industrial and economic life the Populist frenzy may involve half a dozen commonwealths or a wild, passionate, unreasoning demand for debased currency may find almost unanimous expression in a large section of the republic, and yet the sober sense and calm judgment of the rest, out of the range of dangerous ragings or enthusiasms, by mere inertia wears out or crushes out the dangerous excitement. Every year it becomes more difficult to involve the whole people in actions or opinion which may threaten the settled principles of the government, or of commerce, or of trade.

This magnificent chain of lakes bring to your doors, over the cheapest method of transportation from the granery of the country, the food products of the Republic. The level grades along the north and the south shores of these inland seas make your city the terminus of the railroads from the West. The highway made by Nature along the Mohawk Valley to the Hudson, and from the Hudson to the sea, has placed you in water communication by the Erie Canal with the Atlantic Ocean and brought within your borders five of the trunk lines which bind the East to the West. You toll the food which maintains the vast manufacturing populations of New England as well as that which comes for distribution through the cities of the State and to New York. Nature brings you health in the breezes from Lake Erie and Niagara River. Living upon the borders and knowing what war would mean, not only in carnage, but also in the checking of productions and the destruction of industries, you are patriots and not jingoes. The boys living in Buffalo will see Niagara Falls within your corporation. Then Buffalo will stand unique among all cities of ancient or modern times. Then, though Rome may have St. Peter's and London Westminster Abbey, Paris the tomb of Napoleon and Venice the Grand Canal, Buffalo will be celebrated in possessing the most marvelous grandeur in scenery and the mightiest concentration of power which can be seen on the globe. When, after the dedication of the Bartholdi Statue of Liberty Enlightening the World, in the harbor of New York, I carried upon my car the representatives of the French Government to Niagara Falls, these distinguished statesmen and soldiers and sailors of France stood for a moment awestruck in the presence of our mighty wonder of Nature, and then Admiral Jouett broke out with the enthusiastic exclamation: "I have sailed the seas and seen all the sights in the world, and now, having viewed this, I say without hesitation that if ever the stars and the planets hold an inter-universal exhibition the earth will send Niagara Falls."

In bidding you good-night, gentlemen, but not good-bye, for I hope we shall meet many times in the future, I want again to express to you my profound appreciation of this unique and distinguished honor. You might have waited until I was dead and passed a resolution to be engraved upon my tombstone, but it is sweeter far to enjoy taffy while living than to be decorated with epitaphy when dead. May Buffalo in her marvelous future always have as the representatives of her municipal life in every department of activity and aspiration as generous, as gifted, and as broad-minded sons as those who have made and are making her what she is.

A freight wreck occurred on the Lehigh Valley Railroad Nov. 17, (caused by the train breaking in two and running together) which blocked the east and westbound tracks near Flemington, N. J., seven hours. Fortunately no one was hurt. Ten cars were wrecked.

The Brotherhood of Railway Trainmen has voted to remove its headquarters from Galesburg to Peoria, Ill., to which place the Brotherhood of Locomotive Firemen and the Order of Railway Telegraphers have already moved.

Mineral Exhibit of the Southern Railway at Atlanta.

The Southern Railway exhibits in its building at the Atlanta Exposition, illustrated in onr last issue, the largest variety of Southern minerals ever assembled. Among these are samples of coal from several different Southern States, and iron ores from Alabama, North Carolina, South Carolina, Georgia, Virginia and Tennessee. The commercial ores shown are: the magnetic, specular, limonite, cronic, manganese and sulphur.

The other parts of the exhibit are treated under the following sub-headings:

Copper Ores.—Samples from mines in Virginia, North Carolina and Tennessee. Nearly all varieties of copper ore found are located in these three districts and shown in this collection.

Lead, Zinc and Silver Ores from mines in Tennessee, North Carolina and Virginia.

Gold Ores.—About 700 mines are represented from the gold belt, which extends from Virginia to Alabama inclusive. There are many large gold mines on the Southern Railway. The Russell, in Davidson County, N. C., has yielded the owners already over $1,000,000. The new mine "Crawford" opened last year in Stanley County, N. C., has on exhibit some of the large specimens recently found; one weighs ten pounds, another eight and a half pounds. The largest nuggets found in the South are in this collection. Bullion from the Silver Hill Mine which has produced over $2,000,000 is an attractive feature of the collection.

Nickel Ore from Jackson County, N. C., East Tennessee and South Carolina, is well represented.

Monozite.—The only mines found in the south and utilized are on the Southern Railway, and specimens are placed in this exhibit.

Bauxite.—Large quantities from the Georgia and Alabama mines are shown.

Rare Crystals.—Such as Zircon, Stanelite and other crystals are given prominent position.

Corundum.—This mineral is mined exclusively on the Southern in North Carolina, South Carolina, and Georgia; and the specimens shown are massive.

Mica.—Few people are aware of the fact that near the Southern Railway in Western North Carolina are the largest deposits of Mica known. The Mitchell (N. C.) County Mica is the standard of the world. Crystals of Mica, 2½ feet in diameter are in this collection.

Kaolins and Clays.—With the raw material is also shown the manufactured product—China ware, earthen ware, tile, brick, &c.

Tile and Asbestos.—Specimens make up a special case.

Building Stones.—The large variety of building stones shown demonstrate the richness of the South in this product.

Marble.—The advance made in getting out marble in the South is fully represented—over 30 varieties of marble from that number of quarries are shown. Marble is found in Virginia, North Carolina, South Carolina, Georgia, Tennessee and Alabama. Granite and brown-stone are shown from Virginia, North Carolina, South Carolina and Georgia. The soapstone from North Garden Station, Va., is very fine.

Slates.—The specimens of slate are from East Tennessee, Virginia and North Carolina.

Forestry.—A section of the building is devoted to the timber products of the Southern territory. There are on exhibition over 100 varieties of timber.

Aluminum Ore.—The pyramid of aluminum ore is a noticeable feature, and makes a fine companion for the bauxite and red iron ore pyramids.

Agriculture.—Every State through which the road runs is represented. The products shown are wheat, corn, rye, oats, timothy, clover, millet, flax, hemp, buckwheat, beans, peas, pumpkins, potatoes, etc. The tobacco display includes samples from Virginia, North Carolina, Tennessee and Kentucky.

Sheep Industry.—The washed and unwashed wool display is representive of the sheep industry of Virginia, Kentucky and East Tennessee.

Cotton.—A complete display of cotton in bale, lint and seed raised in North Carolina, South Carolina, Alabama, Mississippi and Georgia.

Fruits.—This section is made up of the various varieties found on the line, such as apples, peaches, grapes, pears, etc.

General Collections.—Two of the largest and most valuable collections of native Southern gems.

Art Gallery.—This building is an art gallery within itself aside from the products of the soil, forest and mine; the decorations are extremely pleasing, and consist of not only grains, bunting, taxidermy specimens, but the walls and vacant spaces are filled with one of the finest collection of views of scenery, buildings, cities, towns, factories, schools, resorts, etc., on the line of the Southern Railway. The collection of drawings of railroad building furnished by Mr. Bradford L. Gilbert, the architect of the building, and many of the Exposition buildings is placed in this display. This collection of railroad views alone cost $10,000.

The inside of the dome of the building contains a map of the Southern Railway, showing the location of the leading cities of the South on its lines.

The Lehigh Valley Railroad is attempting to gradually establish a pension fund with which to provide, as far as possible, for their employees who grow old in the service of the company. Recent action on the part of that company provides tickets for the use of the employees traveling on the Lehigh Valley lines, at the rate of one-half cent per mile, and a considerable portion of the amount received from the sale of these tickets is to be set apart for payment into the pension fund. Rules governing the investment and appropriation of the moneys received are to be established.

Russian Railways.

The Russian authorities are giving a large amount of attention to the development of additional railways, says *Engineering*, of London. Without speaking of the colossal enterprise known as the Siberian, which will exert a well-nigh universal influence, we may recall the Archangel line, which will open up immense northern solitudes, and the Samarcand and Andijan line, which, by prolonging the Trans-Caspian, will serve as a counterpoise to the English line from Quetta to Kandahar. The economic influence of the Samarcand and Andijan line will also be considerable, as the Russian provinces in Central Asia will be enabled, having regard to their soil and climate, to supply Russian manufactories with the raw materials which they require. The best descriptions of American cotton do well in these provinces, and viticulture is also developing itself. The American cotton plantations which are being worked in Asiatic Russia only date from 1892, and they are now yielding upward of 70,000,000 pounds of cotton annually. The area of the Russian possessions in Central Asia is immense, comprising 230,000,000 acres, but the number of inhabitants is estimated at only 3,000,000.

Lines are now in course of construction from Pskow to Bologoe, and from Tuckum to Windau. The first of these lines, which is 217 miles in length, will be of considerable importance as a purely transit railway. Most of the products coming from the center and east of Russia, and intended to be exported, are not carried by railways, but reach St. Petersburg by passing over the Volga and certain canals. It is only when summer is at its height, and when there is comparatively little water in the Volga, that these products are carried by railway to Rybinsk. When the port of the Russian capital is frozen, as is usually the case for several months of each year, it becomes necessary to forward exportable goods by railway to Reval, Riga or Libau, and this is a costly operation. The Pskow and Bologoe line will carry exportable goods direct to Riga, without touching St. Petersburg at all. The Tuckum and Windau line will also assist Russian trade. Windau is to Riga what Reval is to St. Petersburg; it is an excellent port, not liable to be frozen, but it has remained hitherto isolated from the general traffic of the Russian Empire, for the want of a small branch line only about 25 miles in length. Such a branch once constructed, Windau, which is nearer Moscow than Libau, will advantageously replace the latter port, which is, besides, being changed into a purely military center. In view of the approaching transformation of Riga and Windau into important centers of Russian export trade, it will be necessary to enlarge the accommodation which they afford, and to construct additional warehouses and elevators. Some other Russian lines, which have been projected, are not of any great extent, but will be found useful from local points of view.

Some Details of Railroad Discipline.

The following is extracted from a paper read before a recent meeting of the Buffalo Superintendents' Association by Mr. C. B. Price, Division Superintendent of the Allegheny Valley Railroad:

Disciplinary action should be frequently bulletined upon the official boards. In doing this, names should never be mentioned, but the parties concerned should be impersonally referred to as "A freight conductor," "A passenger brakeman," "A section foreman," etc., and the offense calling for discipline should be briefly described. In the case of an infraction of any general rule or special order, it is better to merely give the number of the rule or the date of the order, because in the search for the text of the rule or order, which always follows a bare announcement of this kind, other matters are liable to be freshened to the benefit of the searchers after information. In addition to bulletining, a copy of the official notice should be sent to each member of the class of employment to which the offender belongs.

Agents, foremen, conductors and engineers should each be furnished with a scrap-book, in which to keep on file not only notices of this kind, but notices and orders pertaining to all subjects as to which they may be interested or may be liable to receive notice. Once or twice a year there should be an inspection of scrap-books. All possible publicity given in this way to disciplinary proceedings is of the highest importance and value, not only for the purpose of correcting wrong impressions that might otherwise become current as to the findings in such cases, but with the object, as before stated (and I may say, according to personal observation, with the apparent effect), of reducing the chances of the same action being required in the near future.

A service record should be kept, if not of each employee, then at least of each conductor and engineer. A record of this kind, begun about five years ago, is now proving its value to the writer as a means of arriving at correct judgment in questions of conduct and service, as compared with the unassisted memory. To make such a record complete and valuable, all instances of exceptional good conduct as well as of error should go into it, and in considering any case calling for discipline, it is the best policy as well as plain justice to give due weight and credit to these examples of fidelity in arriving at a decision. It cannot be too strongly impressed upon the minds of all concerned that the building up of a good record against a time of trouble is as sensible a proceeding as the accumulation of dollars in a savings bank against a rainy day.

Presidents and other officers of high rank cannot render a more valuable service to their corporations than by discouraging that spirit of martinetism which is the natural outgrowth of the power that rests in the hands of operating officers in immediate command of men. Officers should cultivate knowledge of and kindly interest in the men who are fellow-members of the railroad family. With such a reputation fairly gained, the power of a man in command of men to secure the respect and obedience of his subordinates is very great. In the troublous times that come to our business we sometimes see an officer of this stamp maintaining order and transacting business when wheels are at a standstill all around him.

The history and traditions of the railroad business furnish abundant testimony to the fact that a compound of 50 per cent. of strictness and 50 per cent. of kindness produces the best results in handling men. The examples of Thomas A. Scott and J. H. Devereux and of Thomas J. Potter, show what this practice of strictness without tyranny, and of kindness without laxity, can accomplish. We of a younger generation need not be ashamed to sit at the feet of those masters in the art of handling men, and learn what is taught us by the records they have left behind them—not only such records as are writ in books, but also those that are graven in the hearts of men, still living, who served under their command. Scott and Devereux and Potter were strict and unyielding executives, but they never failed to show justice to those whose every day religion was fidelity; and when the evening shadows fell upon them, and they sat in the cool twilight of life's closing hours, the most restful thought that came to them may have been the consciousness that they had won the hearts of those faithful subordinates with whom they had borne the heat and burden of the day.

Lubrication of Cutting Tools.

Commenting on a paragraph that was recently given wide publicity, to the effect that an air jet is superior to the use of water for lubricating the edges of cutting tools, the *American Machinist* says:

When a liquid is used upon a lathe or planer tool in cutting metals, the power required seems to be reduced, while the condition and appearance of the surface cut is greatly changed. The use of clean water is objectionable, simply on account of the readiness with which everything rusts after being wet, and so it has become the custom to avoid the use of pure water as much as possible. Soapy water is frequently used, and soda water quite generally, and last, because most expensive, oil is used with cutting tools, and better results are secured with their use than could possibly be found with cutting the metals dry, while some operations would be impossible without the lubricant. The effect of the liquid upon the cutting tool and the metal is two-fold, or perhaps it would be more correct to say three-fold. The first and principal effect is that of a lubricant pure and simple. It lubricates the side of the wedge. The cutting tool acts as any other wedge, and the ultimate severing of the metal, no matter how fine may be the edge, is a tearing of the material. The second effect of the liquid is the consequence of the first, or the effect of the lubrication. The lubrication of the wedge prevents the heating of the tool in proportion as it reduces the friction. It does not appear that either of these two effects are accomplished by the air jet. We have little hesitation in saying that we do not believe that lubrication and the consequence of that lubrication, as just mentioned, are accomplished by the air jet. We do not believe that the familiar bright and highly-polished surface that is left by the tool with the water cut is also exhibited by the surface cut by the tool that is "lubricated" by a jet of dry air. The third effect of the liquid flowing upon the cutting tool, the actual cooling of the tool, we have no doubt is also accomplished to a considerable extent by the air jet. If the air is carried at a pressure such as is commonly used for hoists and motors, say six atmospheres, and suddenly discharged into the atmosphere, it must be quite cool and must have a decidedly cooling effect upon the tool that it strikes. We cannot say how close to the actual cutting edge of the tool the cold air may penetrate, but we should judge that it could not penetrate as far into the work and as close to the seat of the actual cutting operation as the liquid would penetrate, and the completeness of this penetration is an important point.

We do not use the water cut for cast iron. The water will rust everything so terribly that we cannot think of that for a minute. It is too expensive an operation to use oil for cutting cast iron, because the oil would be absorbed by the chips so rapidly that none of it could be recovered, and even soda water would make a great mess if used upon cast iron. Still, we are decidedly of the opinion that the use of a lubricant for finishing cast-iron surfaces is well worthy of experiment and investigation, especially for surfaces that are to be used as wearing surfaces. With the lubricant there must certainly be less ultimate tearing of the metal, and a closer surface must result—a very desirable condition for journals and similar uses.

There are many curious phenomena connected with the lubrication of cutting tools by the use of liquids, and the subject will admit of, or we might say demands, much more investigation than it has yet received, and it promises to reward the investigator with results of considerable practical value and importance. Even where a tool stands well and does not seem to heat up much, it is probable that the extreme edge does get quite hot, only that the heat is rapidly carried away by the metal behind the apex. Evidence of this seems to be exhibited in the fact that the petroleum oils are so unfit for this service, while the animal oils are always to be relied upon. The mineral oils are volatized by the heat, and the tool cuts dry, while the animal oils are not affected, and do their expected duty.

The whole subject of lubrication has been neglected until very recently. Too many mechanics have regarded oil, even upon a steam engine, as a convenient and necessary expedient for stopping squeaking and wear, and for making it possible to keep running, instead of regarding it from the first as an essential part of the apparatus, almost as much as a connecting rod is a part of it. The oiling devices upon most machinery appear to be an afterthought, and have a more or less temporizing air about them, instead of appearing to be—as they are and should be—elements of the original design, and thought of and planned for from the very beginning. So the study of lubricants and lubricating devices has come late, but it has already done much for the successful operation of modern machinery. There has been

no systematic investigation within our knowledge of this whole matter of the lubrication of cutting tools, at least in any way commensurate with the importance of the subject, and the promise of advantage to be found in it.

Best Route to Atlanta.

To meet the demand of the traveling public, the Southern Railway has been running its vestibuled limited trains to and from Atlanta to the North in two and three sections. Recently a third limited train was put on, called the Exposition Flyer, leaving New York 11 o'clock a. m., reaching Atlanta the following morning at 10 o'clock. The patronage of this train has been far beyond expectation, and if it continues to increase as it has done, it will require two sections to accommodate the travel. The Southern Railway enjoys superior terminal facilities at Atlanta and, in fact, in nearly every Southern city of importance, and consequently is prepared to give the traveling public better facilities and accommodations.

The connecting lines between Washington and New York are the Pennsylvania Railroad, and the Baltimore & Ohio and Philadelphia & Reading railroads.

No Monopoly.

There is no monopoly in Western scenery. The Rocky and Cascade Mountains are not little bits of property that can be fenced off and made the possession of the few. They are not like parks around the palaces of oriental kings at which we look through gates, and wishing to go in are denied. No, these mountains are grander than any mounds earthly kings can heap up, and are free to the beholder. Their lofty domes, forever white, look down on valleys where frost seldom comes. Their sides are clothed with forests and veined with metals useful to man. Their rocks stand like giant statues on the horizon. The clouds hover about their peaks and fill the skies with pictures for artists. These things are free and can be seen from the cars of the Great Northern Railway in a picturesque trip from St. Paul and Minneapolis to Puget Sound.

Pennsylvania Railroad Excursions.

The Pennsylvania Railroad Company has placed on sale at its principal ticket offices excursion tickets to all prominent winter resorts in New Jersey, Virginia, North and South Carolina, Georgia, Florida and Cuba. The tickets are sold at the usual low rates.

The magnificent facilities of the Pennsylvania Railroad with its many connections, make this a favorite line for winter travel. An illustrated book, descriptive of winter resorts, and giving routes of travel and rates for tickets, will be furnished free on application to ticket agents.

Fast Time on the Santa Fe.

The Atchison, Topeka & Santa Fe has begun a through service to the Pacific coast that shortens the time to California by half a day. The train will run daily and will make the trip to Southern California in three days, and to San Francisco in three and a half, beating previous records of transcontinental travel. The first train, which started full, consisted of a compartment car, two sleepers, a chair car, a dining car and a baggage car. There are eight of these trains altogether, and they are equipped in elegant style, being finished in mahogany throughout.

The reducing of the schedule makes it possible for a business man to leave New York on Saturday after the close of business, reach San Francisco Wednesday evening, transact business at San Francisco on Thursday, leave there in the evening and reach New York early in the forenoon of the following Monday, thereby accomplishing the journey from New York to San Francisco and return in about eight days, and being absent from business exactly one week.

A broken axle caused a freight wreck on the Central Railroad of New Jersey, Nov. 18, by which four cars were wrecked.

The South Carolina constitutional convention recently adopted an article that railroads operating in that State must obtain charters from the State.

During a heavy fog that prevailed over New York and vicinity, early Tuesday morning, Nov. 18, there was a rear collision of cable trains near the Brooklyn side of the great suspension bridge, by which two men were killed, one a passenger.

They have a short way with strikers in the dominions subjected to the paternal government of the Czar. A strike having taken place recently at certain coalpits in Poland, a troop of Cossacks was sent to the scene, and 14 of the ringleaders were singled out and soundly flogged by the soldiers. It is reported that "there was then a prompt and general resumption of work."

A night express on the Pittsburgh & Lake Erie Railroad arriving at Beaver, Pa., Nov. 18, stopped short of the station. The Pullman conductor stepped from the car, as he thought, to the station platform to assist a lady passenger to alight. The lady saw him disappear, and called to the porter that the conductor had fallen over an embankment. Instead of this, however, it was found that he had fallen over the side of a trestle to the Cleveland & Pittsburgh Railroad, 50 feet below. When picked up he was dead, his neck having been broken.

Ocean Steamship Speeds.

While so much attention is being given to the increased speed of railroad trains, the speed of ocean vessels has not been neglected by those interested in the same, and constant improvement in this is being made, with the probability of the same being continued indefinitely. In a recent interview Mr. Alfred F. Yarrow, the English shipbuilder, said:

"The man who talks of finality in improvements must indeed be bold. Even with present knowledge it is evident that vastly increased speed is possible by the use of lighter materials in construction—aluminum, for example, instead of steel. In all questions of this kind, however, it must be borne in mind that increase of speed is largely dependent upon increase of cost. The last access of high speed has been mainly brought about by the introduction of water-tube boilers.

"Eighteen years ago our highest speed was 21½ knots—that was in the case of a torpedo boat built for the British Admiralty. That vessel was half the length of our latest torpedo boat, *Destroyer*. Since that date we have been steadily increasing our speed by means of triple compound engines and higher boiler pressure, with the result that we have to-day a vessel doing over 30 knots per hour. This last jump, due to the employment of water-tube boilers, will probably carry us about 35 knots. Any further increase of speed will be obtained through some possible but unforeseen invention which, so far as I know, is not in sight of engineers at the present time. It is not rash to prophesy an increase of five knots within the next decade.

"Passenger steamers keep following up and adopting the principles employed in torpedo boats. When the latter had a top speed of 21½ knots, Atlantic liners were only doing 13 to 14 knots. To-day the Lucania and Campania steam 21 knots, and this is solely due to the constructors of these large vessels following out what they have seen to be possible in torpedo boat construction. When the Atlantic passage was of 14 days' duration it was easy enough to knock off a couple of days. That, of course, is impossible now. It can only be a question of a few hours. But this can be attained by the employment of water-tube boilers and by an increase in size. Every important pace-making Atlantic liner will be bigger than the last. There will be increased steam pressure and reduced weight—the latter due to the employment of lighter and stronger material. Aluminum will take the place of copper and gun metal (certainly of the latter) in the matter of fittings, and by this means alone weight can be greatly reduced. It can also be used in the construction of ships' hulls. With aluminum, water-tube boilers and increased pressure no one can say where the speed of ships will stop."

Past and Present Cable Rates.

Oceanic cable rates have been greatly reduced since the transatlantic cable first became a success, but cabling is still in large part a business necessity or a luxury of grief. Cable rates to London in 1866 were $100 for twenty words. They were reduced in the same year to $50 for twenty words. Next year they became $26.25; in 1868, $16.41; in 1870, $15; in 1871, $10. Then, in 1872, came the word rate of $1. It rose to $1.50 in 1873, and has since been at various times, according to the conditions of competition, $1.50, 75 cents, and for a while in 1886, 12 cents. The present rate of 25 cents was fixed in September, 1888. Cable rates to places on the west coast of Africa run as high as $2.66 per word. The rate to the Island of Mauritius when the Red Sea cable is interrupted, and messages cannot be delivered by way of Aden, is $4.14. The rate to New Caledonia is $2.51, and other Australasian rates vary between $1.27 and $3.23, according to the route employed.

The cable company usually quotes rates to European countries without naming places, unless perhaps the capital. Of course rates may be much higher than the quoted tariff when obscure interior places are to be reached. The telegraph companies join in publishing at Berne a volume that professes to give a list of all the telegraphic stations on earth. The number is between 87,000 and 90,000. Officers of the telegraphic companies hazard the guess that the cable would not be freely used for social purposes, even if the rate to London were as low as 10 cents a word. One reason is that while it is a simple matter to telegraph from New York to a well-known address in London, it is a much more difficult thing to be sure of addresses in provincial towns, and especially in continental places, where a foreign language comes in to increase the liability of confusion.

The expense of correcting a mistake when telegraphing upon land lines within the territory of a single country is comparatively small, and may be done with reasonable promptness, but when it comes to correcting a blunder in a trifling cable message of purely social significance, the cost is absurdly out of proportion to the importance of the matter involved. So, while some millionaires make a toy of the cable, as of almost everything else, to most persons submarine telegraphy is what Lowell described it after the news of the death of Agassiz came to him at Florence, more than twenty years ago:

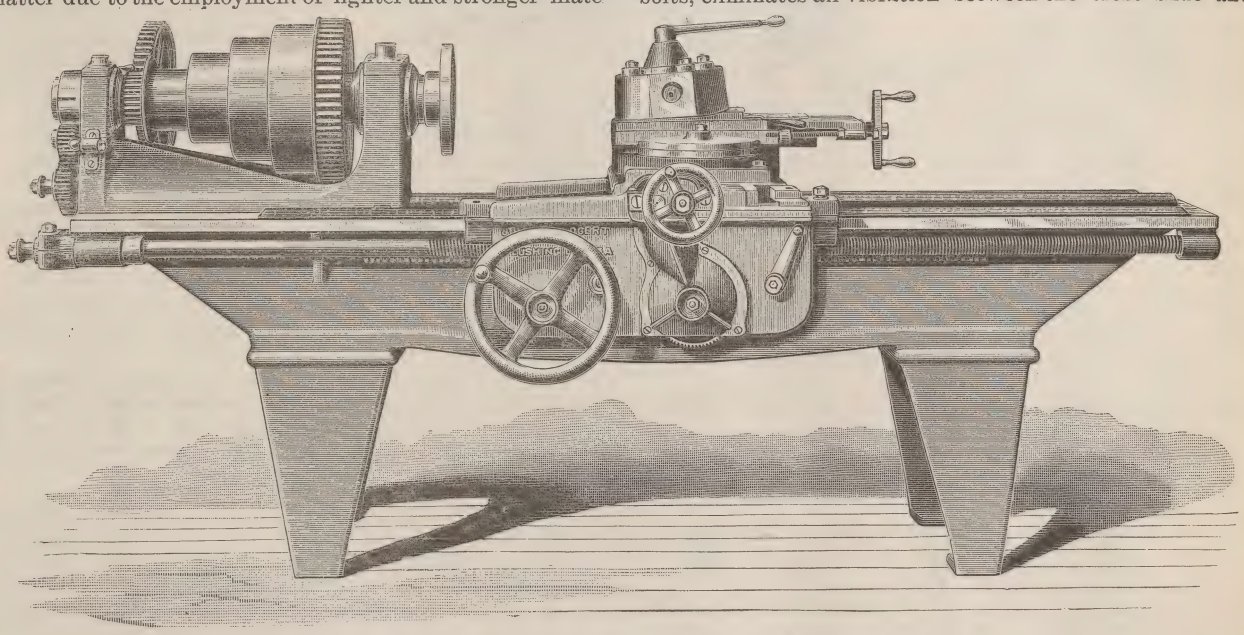
> The savage of the skies that men have caught
> And some scant use of language taught,
> Tells only what he must—
> The steel-cold fact in one laconic thrust.

Universal Turret Engine Lathe.

The lathe illustrated herewith is designed for a wide range of useful work, and is made by Mr. John L. Bogert, of Flushing, Long Island, N. Y. The bed of the tool is 8 feet 3 inches long, and the swing permitted is 20 inches.

The head stock is fitted with boxes lined with best phosphorized babbitt metal, and is adjustable for all vertical wear. The front bearing is 3½ inches in diameter, and 5⅝ inches long. The front cap is held and adjusted by four ¾ inch bolts, and, like the back cap, has an oil cup for the continuous supply of the lubricant. The spindle of hard steel has a 1¼-inch hole through its axis, which may be bored out to 2 inches. The end thrust is taken by hardened steel collars, ground perfectly parallel. The cone has four steps for a 3½-inch double belt. The back gearing has a ratio of 12 to 1. The direction of all power feeds is changed by a rocker on the back end of the head stock. The turret is 11 inches in diameter, usually planed four sided, and bored for four two-inch holes.

A tool 5½ inches in diameter will swing clear of top of turret slide, which is 22 inches long, 10 inches wide, and carries the adjustable hardened steel lock bolt, with hand lever for withdrawing and seating the same, and has an extreme feed movement by hand of 8 inches, controlled by stops. The index is a large, flat, hardened steel ring, The turret stock is mounted on the top of the cross slide with a swivel base 15 inches in diameter, graduated in degrees, and is clamped by two ¾-inch bolts. The cross slide is 20¾ inches long and 15 inches wide, and permits a cross feed for the full swing of the lathe. A telescopic slide always protects the cross feed screw and gearing from chips. The cross-slide anchor, 12 inches long, and secured by two ¾-inch bolts, eliminates all vibration between the cross slide and carriage. Suitable stops permit the exact return of the turret tools into line with the spindle, and control their setting. The carriage is 33 inches long. The apron contains separate powerful friction gearing, for the longitudinal and cross feeds, and half nuts used only for screw cutting. With the change gears regularly furnished, threads from 1 to 16 per inch may be cut without compounding. The countershaft is fitted with double patent friction pulleys, 15 inches in diameter and 4 inches face. It is designed to make from 160 to 180 revolutions per minute forward, and from 180 to 220 revolutions per minute backward.



20 INCH UNIVERSAL TURRET ENGINE LATHE.

The Car Shop Trade.

A result of the increased activity in the car shops is seen in the more happy conditions existing between those establishments and the saw mills and lumber dealers, says the *Timberman* It used to be the case that there was almost constant friction in this direction. It used to be the ambition of almost every yellow pine saw mill to cut car stock. There was warm competition and over supply of material, with the result that the mills were very largely at the mercy of the shops. The latter were inclined to be rather critical; in fact, sometimes quite serious charges were made against their purchasing agents by the mills, and there was friction and repeated trouble. But within a few years past, largely as the result of association effort, the yellow pine mills have been turning their attention in other directions. They have been cutting more for the general trade and less for particular uses.

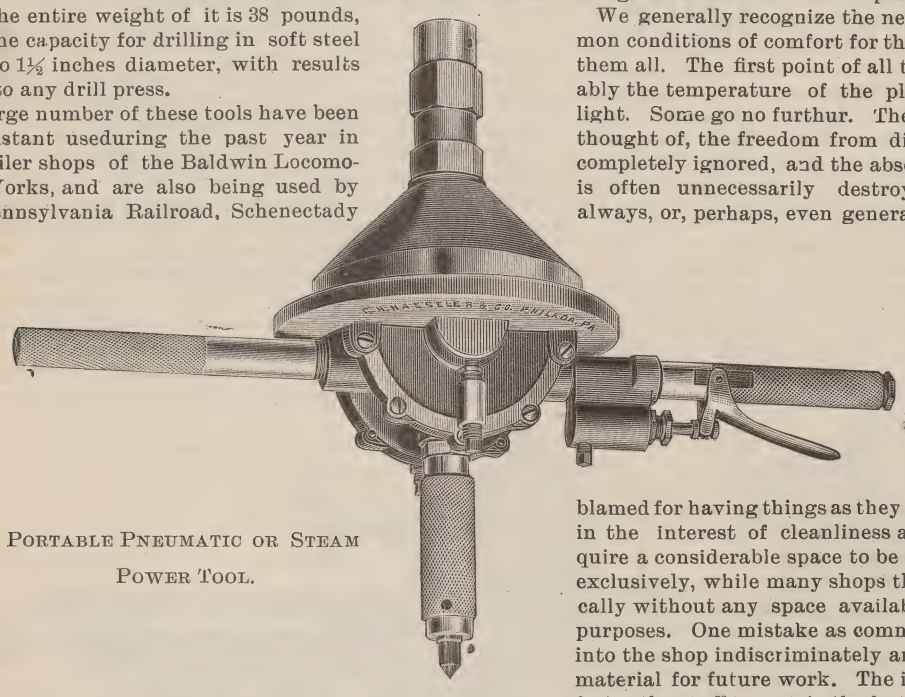
The result is that in such a season as this, when the car shops are crowded with work and are active buyers, they have to go to the mills for material, for their yellow pine, Norway, fir and what not, and no longer can sit at home and let lumber salesmen bid against each other for the privilege of supplying them. They have to cultivate the saw mills nowadays, with results that are satisfactory to them. Though prices have been low on car stock the past summer, there have been few, if any, complaints of irregularities, and transactions are done with an ease and smoothness which at one time would have seemed almost miraculous. Doubtless this is largely true, also, because the mill men know the business better than they used to, and their rights in the premises. They are no longer the "soft marks" for cunning buyers they once were. They know how to do business on business principles and expect to be treated in a business way, and an expectation of that kind is usually realized.

Phoenix Portable Power Tool.

The following engraving illustrates the Phœnix Portable Power Tool, which is at present being used by many of our leading industries engaged in bridge, ship, boiler and locomotive building, and has created much favorable comment as a labor-saving device. The machine is operated by compressed air, at a pressure of from 20 to 80 pounds per square inch, according to the work to be performed. The uses for which the tool is especially adapted are reaming rivet holes, drilling, tapping stay-bolt holes and screwing the stay bolts in, and counter sinking,

Three sizes have been placed on the market: the No. 1 tool is the lightest, weighing but 28 pounds, and is principally used for stay-bolt tapping work; the other sizes, No. 2 and No. 3, are stronger and more powerful machines and are practically the same in construction, the only difference between them being that the No. 2 is built so that it can be operated by steam, if compressed air is not available, but the manufacturers do not favor the machines being run by steam on account of the necessity of leading the exhaust off from the machine and the difficulty of keeping the motor properly lubricated when steam is used; and also considerable allowance must be made for expansion of the different parts, which prevents fitting the working parts as snugly as for air. The No. 3 machine is stated to be the best all around tool; the entire weight of it is 38 pounds, and the capacity for drilling in soft steel is up to 1½ inches diameter, with results equal to any drill press.

A large number of these tools have been in constant useduring the past year in the boiler shops of the Baldwin Locomotive Works, and are also being used by the Pennsylvania Railroad, Schenectady Locomotive works, Cooke Locomotive Works, Brooks Locomotive works, Rogers Locomotive Company, and many of the principal boilers ship and bridge building concerns of the country.



PORTABLE PNEUMATIC OR STEAM POWER TOOL.

A novel application of this tool occurred a few months ago. It appears a party took a contract to break up a large tonnage of cast-iron salamanders for the Illinois Steel Company; it was the intention of the contractors to drill holes 1¼ inches in diameter and 14 inches deep in the salamenders and then burst them apart by a charge of dynamite. After the contract was awarded a representative of the Phœnix drill happened along, and gave the contractors an exhibition of what the little tool would do. The machine he had was a No. 2, and was operated by steam, drilling a hole 1¼ inches in diameter, 16 inches deep in eighteen minutes. It is needless to say a sale of the drill was effected on the spot, as it required five hours to drill a hole of the same dimensions by hand ratchet. The patentees of the tool are Messrs. C. H. Haeseler & Company, of 1001 Hamilton Street, Philadelphia, dealers in pneumatic tools and appliances of every description, and the machines are built for them by the Pedrick & Ayer Company, of Philadelphia.

The Happy Hunting Grounds, also Fishing, of the South

Under the above pleasing title the Southern Railway has in press a beautiful and comprehensive book appertaining to the hunting and fishing of the states through which that system extends. This, indeed, comprises nearly the entire South, including Virginia, North Carolina, South Carolina, Georgia, Alabama, Mississippi, Tennessee and Kentucky, as throughout these states the Southern Railway has its own lines.

The book is written in the happiest style of Mr. William Bruce Leffingwell, of Chicago, and the illustrations are ample and are especially prepared for this particular volume. This is the first time that such a publication has been attempted, exhibiting in such an attractive manner the almost innumerable resorts for sportsmen in the south.

We are pleased to note that the "Security Lock Bracket," manufactured by the Chicago Grain Door Company, is coming into quite general use. It is now in use in large quantities on the following different roads, viz. : Illinois Central, Lake Shore & Michigan Southern, Chicago & Grand Trunk, Northern Pacific, and Intercolonial Railway of Canada. When these representative roads adopt an article its value is evident.

The Chicago, Burlington & Quincy has arranged for a series of three personally conducted tours to California this winter. The trip will occupy thirty-six days, including stops on the journey at San Antonio, El Paso, Riverside, San Diego, Santa Barbara, Pasadena, Mount Lowe, Del Monte, Lick Observatory, on the summit of Mount Hamilton, and Santa Cruz. The return will be via Salt Lake City, Glenwood Springs, Marshall Pass, Colorado Springs and Denver. The rate for the trip will be $350, which will cover all expenses, including hotels, etc.

Dirt in the Shop.

If anyone should be clean by instinct and in practice it is the shop foreman. As the housewife should be ashamed of dust on the piano and mud on the kitchen floor, as inimical to health and restful comfort, so should he be ashamed of everything in the shop that is not essential to its orderly and profitable operation. The difference in shops in this respect is evident to an experienced eye the moment the door is opened. A clean shop may give the idea of roominess, and seem to be a place where free and easy movement is possible entirely without regard to the size of it, and this will always be the place where we shall expect to see the best and the most work turned out. The shop that is crowded and cluttered up with finished and partly finished work, and with castings or material other than that immediately in use, or immediately to be used, is constantly working at a disadvantage. No shop can be so big that inconvenience and additional expense of operation will not result from ignoring the imperative conditions of a liberal cleanliness. If we take a moment to consider the matter in detail we can easily understand how it may affect and hinder the individual workman to be overcrowded and hampered in his movements around the machine that he is operating, and to have his mind distracted by the presence of things with which he has no present concern.

We generally recognize the necessity of securing the common conditions of comfort for the men, but few of us include them all. The first point of all to receive attention is probably the temperature of the place; and next to that the light. Some go no furthur. The purity of the air is seldom thought of, the freedom from distracting noises is almost completely ignored, and the absolute freedom of movement is often unnecessarily destroyed. The foreman is not always, or, perhaps, even generally to blame for having an over-crowded and disorderly shop. The foreman, as many of them know to their sorrow, is as often in the position of a scapegoat as he is in that of a responsible and independent manager of a department. He too often is not allowed to have things as they should be, while he is readily blamed for having things as they are. No shop is so small, that in the interest of cleanliness and freedom, it does not require a considerable space to be used for storage purposes exclusively, while many shops that are not small are practically without any space available for or devoted to such purposes. One mistake as common as any is in crowding into the shop indiscriminately and as rapidly as possible the material for future work. The idea seems to be that the faster the stuff is sent in the faster the work will be crowded out, like feeding sausage meat to a machine. It does not worked that way. You can choke a machine so that it will not work at all, and it should be possible when this thing is overdone to choke the shop so that it would stop, and this might lead to some reformation. The desire to choke some one under such circumstances has often arisen.—*American Machinist.*

Obeyed the Order.

A short time ago an order was issued on one of the lines of the Pennsylvania Railroad for all section men to come to the office on a certain day and have their eyes examined. The following day a number of men appeared and passed the examination. Just before the man who had charge of the tests left the office a messenger boy came hurrying in with a small package neatly tied up and addressed to the eye inspector. The latter opened it, and was surprised to find a glass eye wrapped up in tissue paper, and also an old-fashioned silver watch. The contents of the package proved a puzzle to the inspector until he unfolded a hastily scribbled note, which, on being deciphered, was found to read as follows :

"Oye inspector :

"Dear Sir : The day before yesterday at nune I got word to cum down and have me ise looked after for culur blindness as ye call it. I had forty-five ties and ten rails to put down beyond the sand cut and as jerry Sullivan and Dominick Coolly were laid up since the wake that wuz holded over the ded corpus of Danny Doherty my hands war too short to spare me. 'Twas lucky that the rite oye that was first in my head put out with the blow of a pik and me glass oye that is a perfect figger of the eye that was not put out is sent to you together with my watch for the hexamination. I culd spare the glass oye better than the oye in the head and if she is culur blind Il get one that ain't.

"Yures truely,

"ANTHONY DRISCOLL."

The Jerome metallic packing was specified on the 14 engines recently built by the Rogers Locomotive Works for the Chilian Government and also on the 24 engines recently ordered by the Chicago & Northwestern.

The Pratt & Whitney Company, of Hartford, Conn., has issued a book of 390 pages that illustrates and describes a large variety of the numerous machines and tools it manufactures. This embraces many metal working devices.

The Long & Allstatter Company, of Hamilton, O., have issued a new and very neat catalogue of punching and shearing machinery. This company manufactures a complete line of machinery for punching and shearing metal by power, over 350 sizes and varieties, besides innumerable designs to suit special kinds of work.

The Chicago "Rabbeted" grain doors have been specified on the 1,600 new Illinois Central box cars recently ordered. This grain door is coming to the front very rapidly. It removes the only obstruction permitted in modern box cars viz., rods, and is admitted by car builders to be superior in design and more durable than any other door in the market

"Pat" Lowered His Voice.

Father O'Halloran had a telephone put into the parsonage in connection with the church and the parochial school. Patrick McFee, his reverence's handy man, was instructed in the use of the instrument, and it was only the next day, when Pat, dusting out the church, heard the ringing of the telephone bell. Taking down the receiver, Patrick was pleased to hear Father O'Halloran's familiar voice asking him something or other about his work. In essaying to answer he remembered that his reverence was a long way off, and therefore he shouted into the transmitter at the top of his voice.

"I don't understand you, Patrick," said the telephone. Patrick tried again with no better success. On his third trial he came near splitting the telephone, but again came Father O'Halloran's voice, "I can't hear what you're saying, Patrick." Pat had by this time lost something of his patience, and, as he stood gathering his breath for a fourth blast, he couldn't refrain from soliloquizing in a low tone : "Ah, may the divil fly away wid the ould fool!" But Pat dropped the telephone like a hot potato and fell to his knees in dismay when he heard Father O'Halloran's voice once again: "Now I hear you perfectly, Patrick."—*Boston Transcript.*

How many directors are there in this company, boy? Six and myself. You a director! Absurd! Yes, sir; I'm the directer of envelopes.

Porter—Train's awa, man. Ye should hae ran faster.
Passenger—Ran faster! Dod, 'a ran fast eneugh, but 'a should ha'e starit sooner.—*Punch.*

Oi heerd yez are on a shtroike, Casey? Oi am. Oi shtruck for shorter hours. An' did yez git thim? Oi did. Shure, Oi'm not wur-rkin' at all.—*Judge.*

Wot's de matter, pardner? Did she throw water in yer face? Only on me face; only on me face. I had the presence of mind to shut me mouth when I seen it coming.

A certain German lost a few hundred dollars recently on options. When his neighbor asked if it was a "bull" or a "bear," the disgusted German replied : "Neider; I vas a shakass."

Scene: Terrible storm, a 'bus crammed full, smart woman on the pavement. Conductor (to inside passengers)—Can you squeeze a lady in there? Innumerable male voices (in chorus)—Yes, certainly. (Smart woman gets in and gets squeezed.)

"Just as we arrived," the driver of the patrol wagon testified, "the prisoner and some more of his gang were trying to drop Officer McGobb through a sewer manhole." "Sure," said Mike the Brute. "I didn't know there was any law against droppin' a copper in the slot."

Riehle Bros. Testing Machine Company have a 100,000-pound automatic and autographic testing machine at the International Exposition, Atlanta, Ga. This machine forms a part of the Government exhibit, and is in the Minerals and Forestry Building, where any one interested can see it in operation. Tests are being made upon this machine during the day, and it is attracting considerable attention.

Our Directory

OF OFFICIAL CHANGES IN NOVEMBER.

We note the following changes of officers since our last issue. Information relative to such changes is solicited.

Canadian Pacific.—Master Car Builder John Higginson has resigned.

Chicago & Eastern Illinois.—Assistant Superintendent Motive Power Albert Griggs has resigned, and the office is abolished.

Choctaw, Oklahoma & Gulf.—Henry Wood is appointed Acting Manager.

Cleveland, Cincinnati, Chicago & St. Louis.—Assistant General Manager C. E. Schaff has been appointed General Manager.

Delaware, Susquehanna & Schuylkill.—L. C. Smith is appointed Superintendent..

Duluth, Mississippi River & Northern.—J. F. Killorin is appointed General Manager.

Erie.—F. N. Hibbits, Master Mechanic of the Rochester Division, is promoted, and is succeeded by Frank Toumey.

Georgia Southern & Florida.—Jeff Lane is appointed General Superintendent.

Great Northern.—J. M. Barr is appointed General Superintendent Eastern District.

Gulf & Interstate.—E. E. Stoup is appointed General Superintendent.

Lehigh & Hudson River.—F. W. Mast is appointed Master Mechanic, vice H. M. Messimer, resigned.

Louisville, Evansville & St. Louis.—Superintendent of Motive Power J. K. Lape has resigned, and the office is abolished. W. C. Looney is appointed Master Car Builder. J. F. Sechler is appointed Master Mechanic.

New Orleans & Western.—Chief Engineer A. W. Swanitz is appointed General Manager with office at New Orleans.

New York, Pennsylvania & Ohio.—John Tod, Vice-President, is appointed Receiver.

Norfolk & Western.—Henry Fink is appointed Receiver.

Northern Pacific.—F. C. Prest is appointed Purchasing Agent.

Oregon Improvement Company.—B. F. Bush is appointed General Superintendent.

Panama.—James R. Shaler is appointed Superintendent

Pennsylvania.—A. Welsh is appointed General Manager of the Philadelphia Belt Line. T. R. Brown is appointed Master Mechanic of Juniata shops.

Plant System.—J. F. Sheahan is appointed Master Mechanic at Palatka, Fla.

Tennessee Central.—C. O. Godfre is appointed Receiver.

Terminal Association of St. Louis.—E. P. Bryan will succeed General Manager Joseph Ramsey, Jr., Jan. 1, when Mr. Ramsey goes to the Wabash.

Union Pacific, Denver & Gulf.—Purchasing Agent B. L. Olds has resigned, and the office is abolished, and its duties are assumed by General Superintendent T. F. Dunaway.

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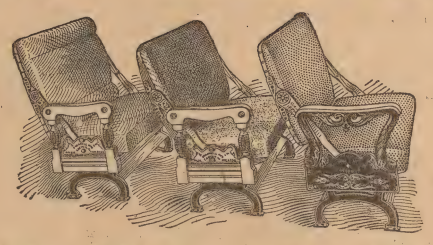

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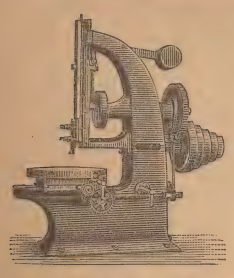

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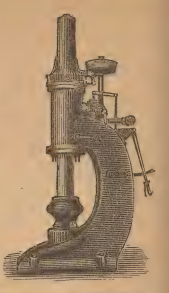

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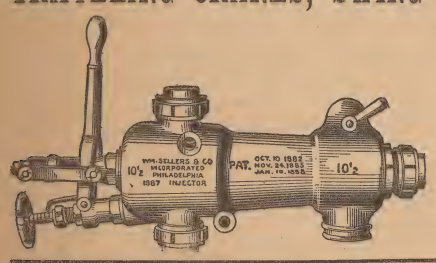

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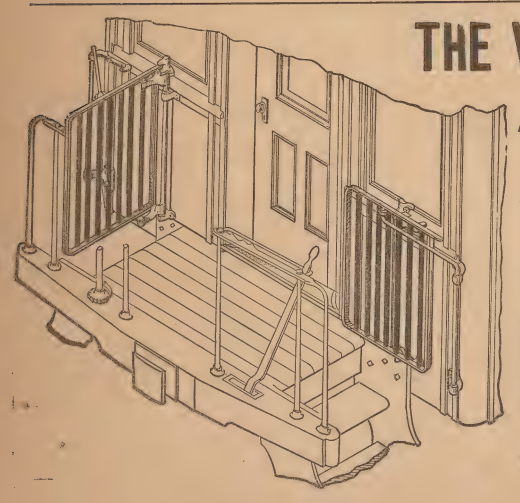

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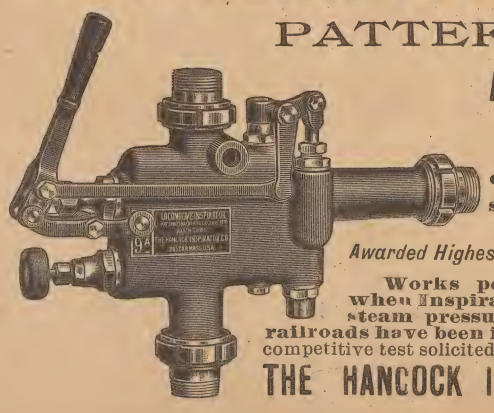

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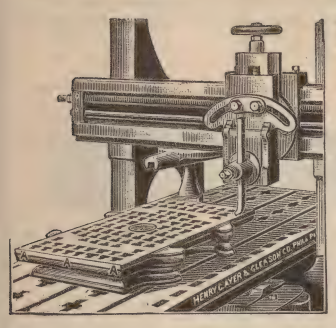

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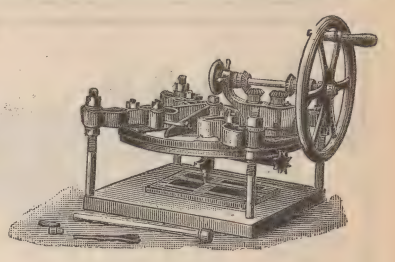

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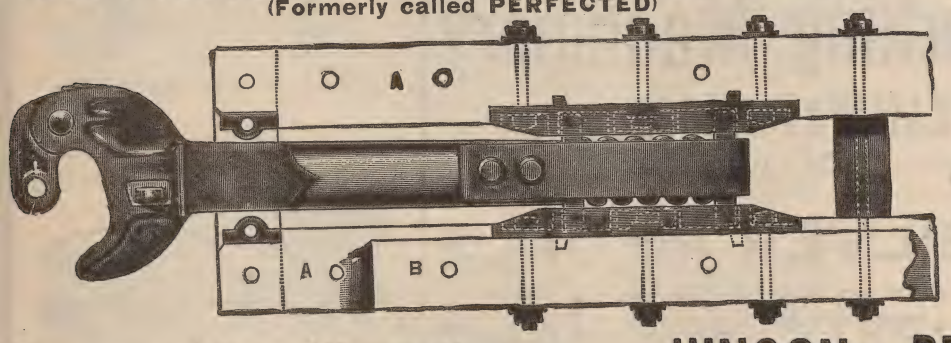

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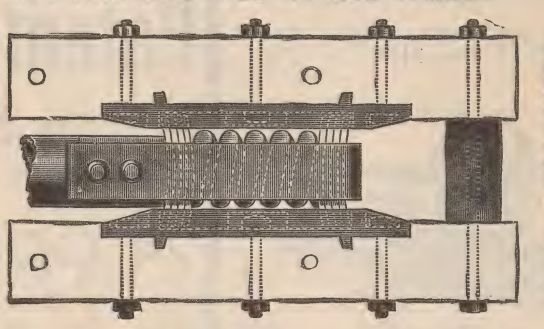

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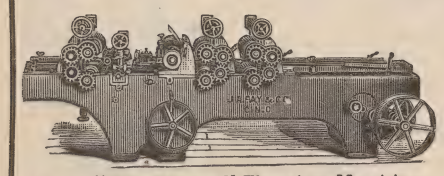

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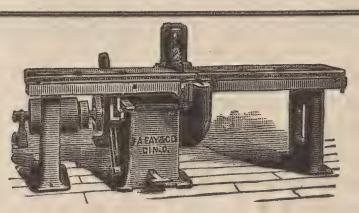
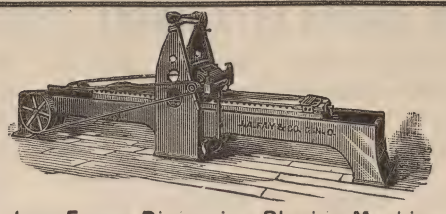
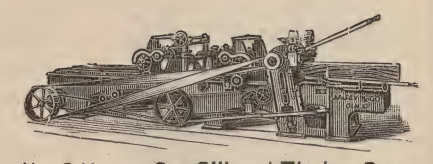


No 3. Automatic Railway Cut-Off Saw.



Iron Frame Dimension Planing Machine.



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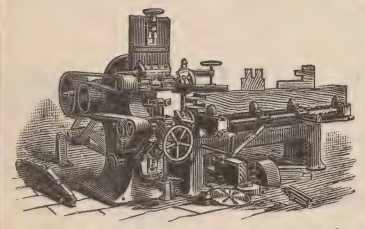

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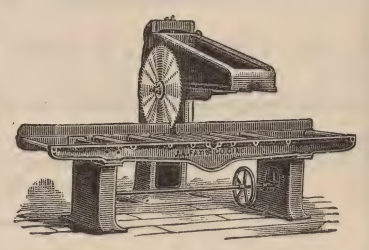
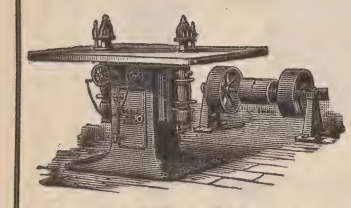
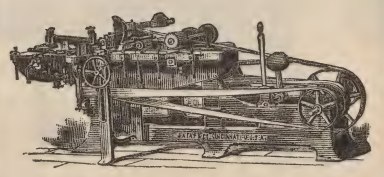


Column Bracket Cut-Off Saw.



No. 3 Large Car Shaper



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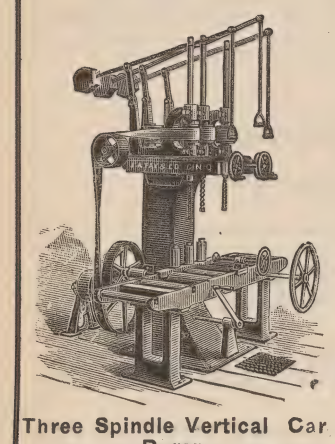
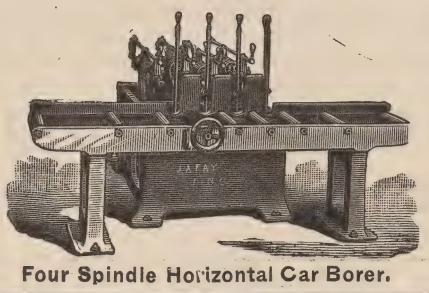
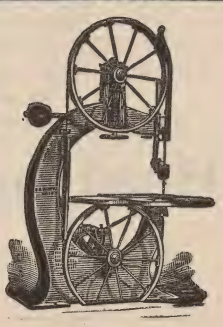


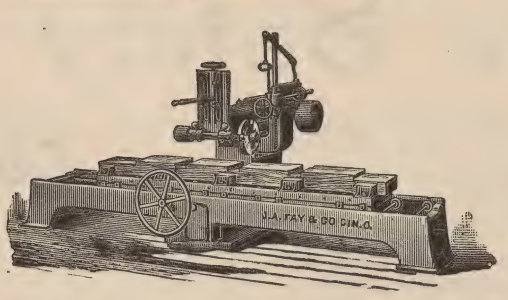
Three Spindle Vertical Car Borer.



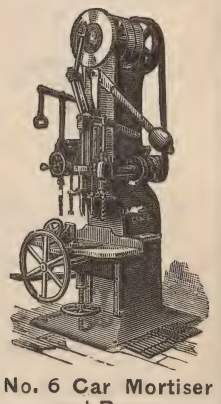
Four Spindle Horizontal Car Borer.



No. 3 Band Saw.



Large Automatic Car Gaining Machine.



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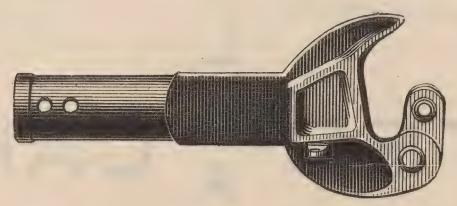

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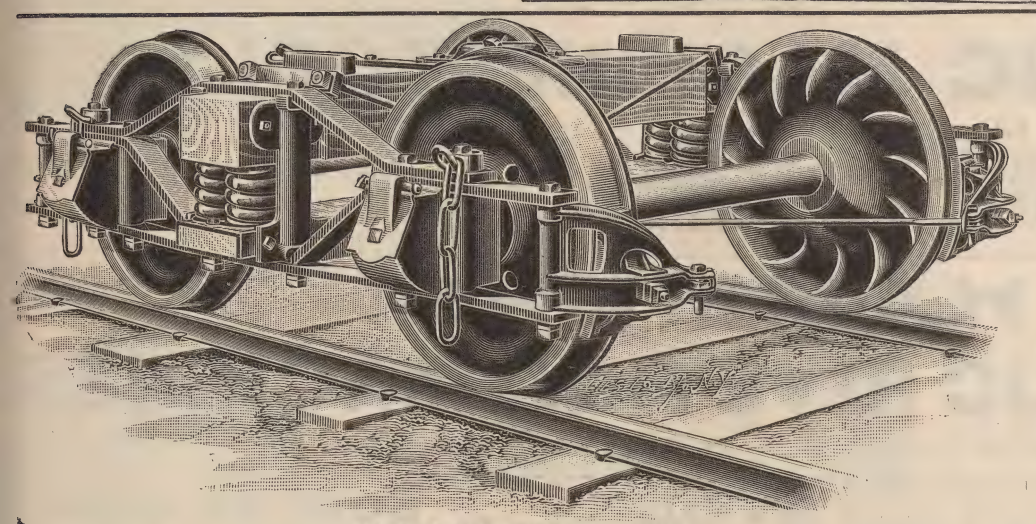

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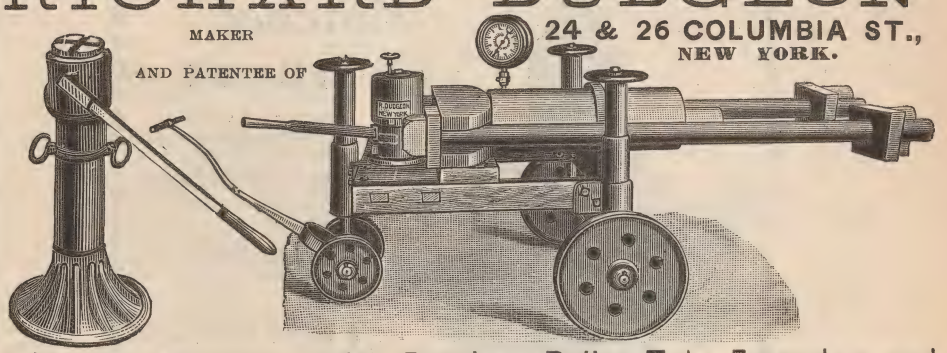

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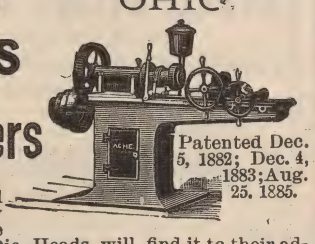

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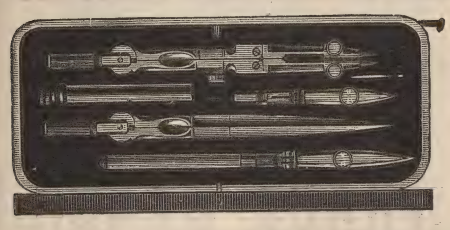

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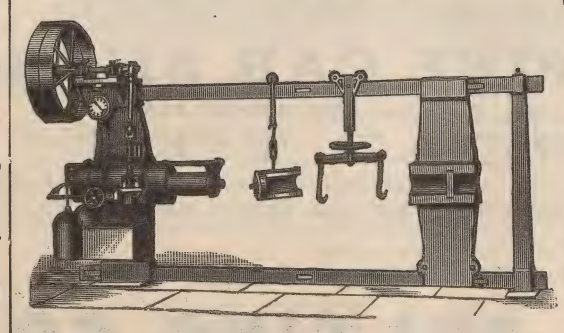

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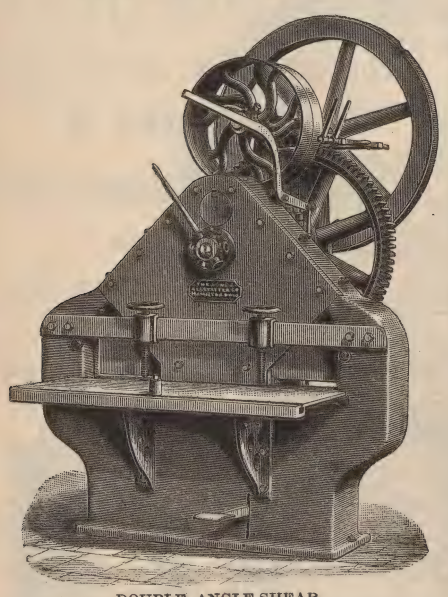

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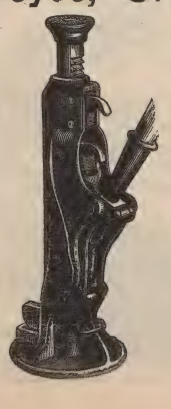

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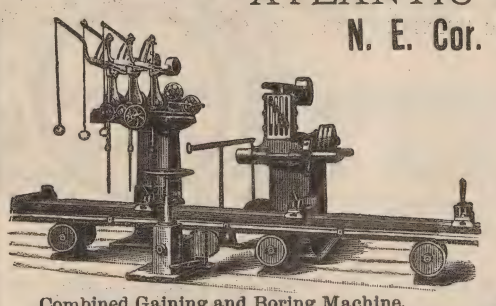

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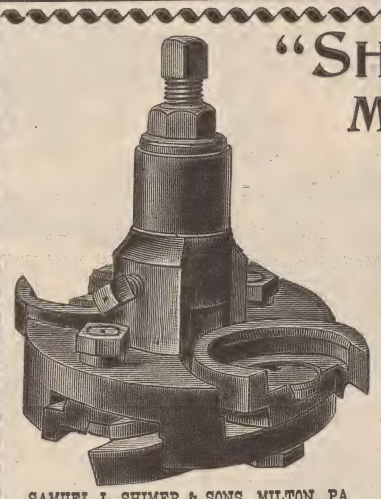

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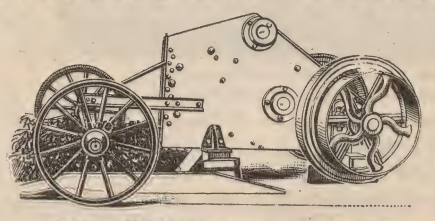

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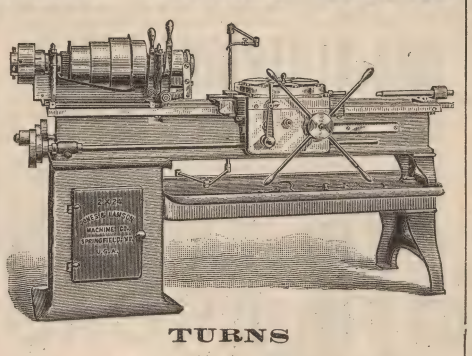

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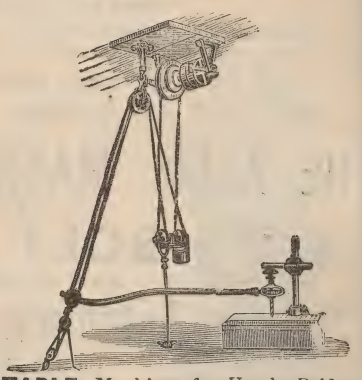

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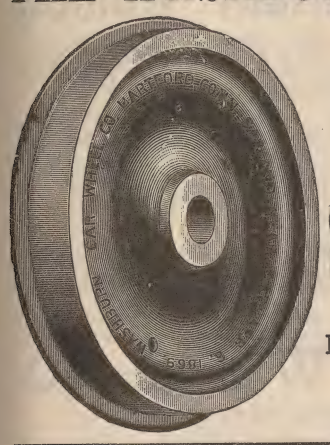

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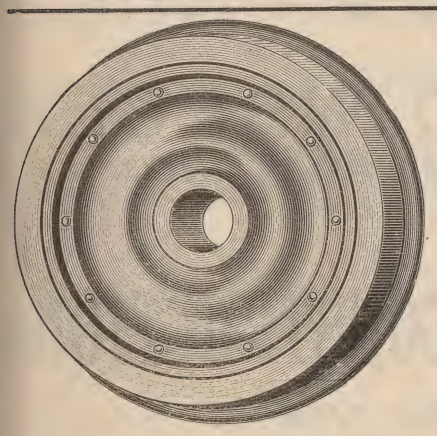

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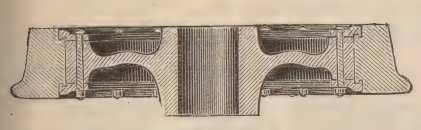

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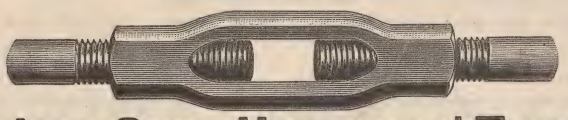

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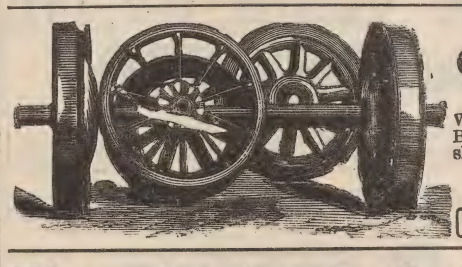

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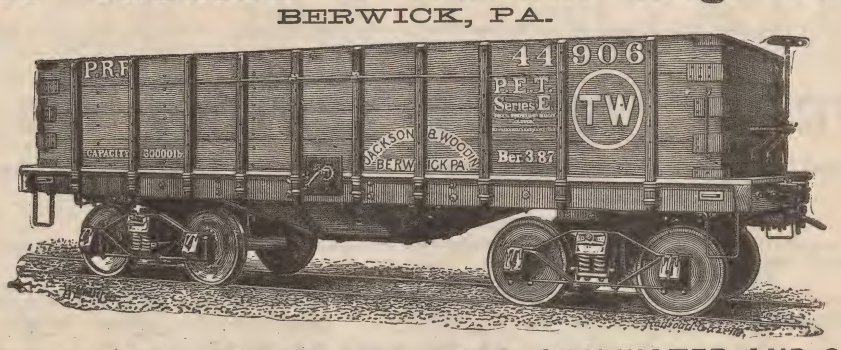

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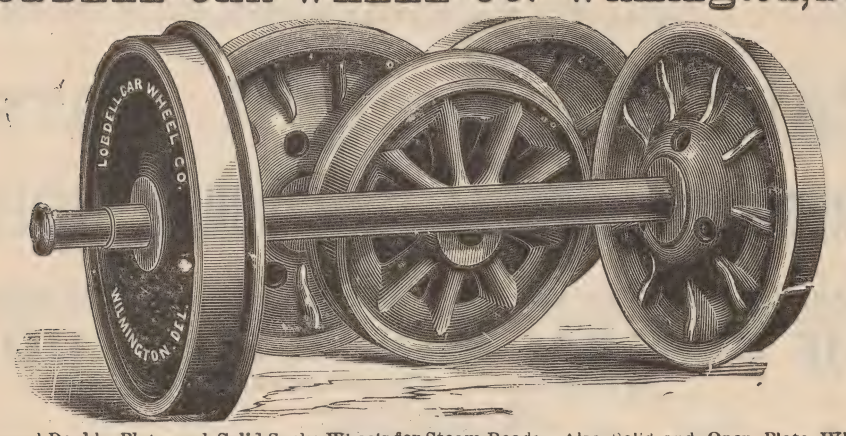

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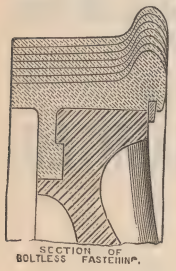

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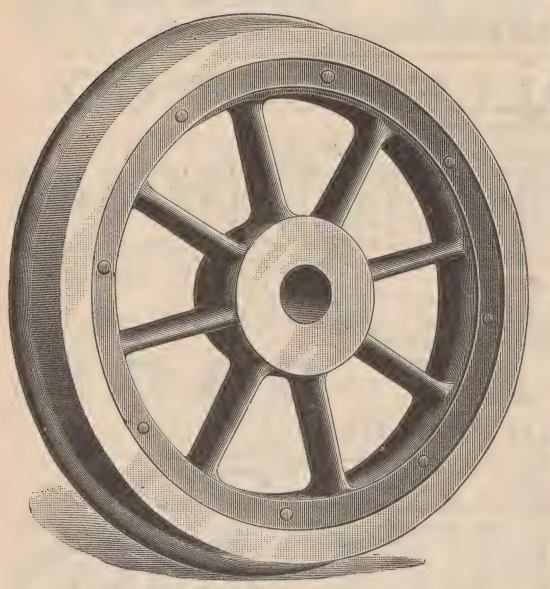

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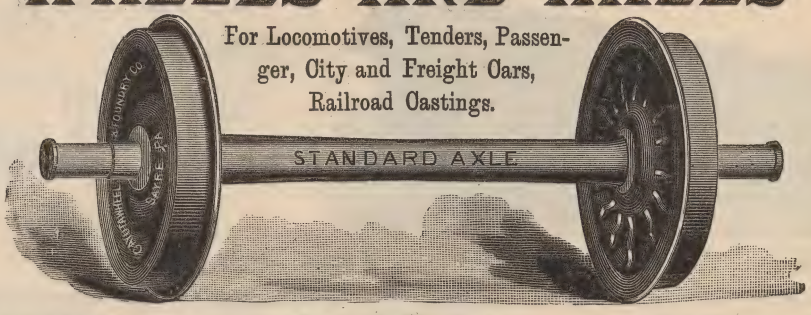

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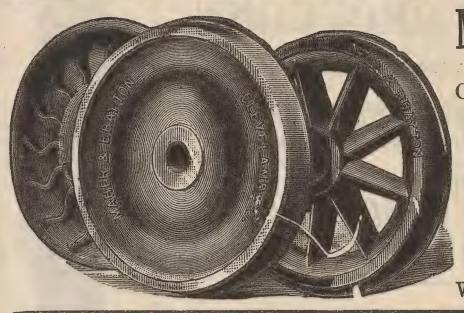

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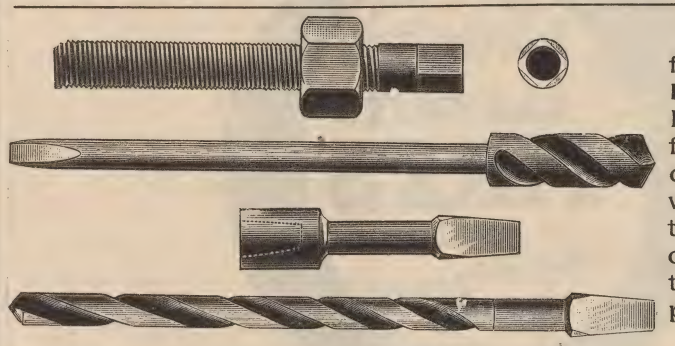

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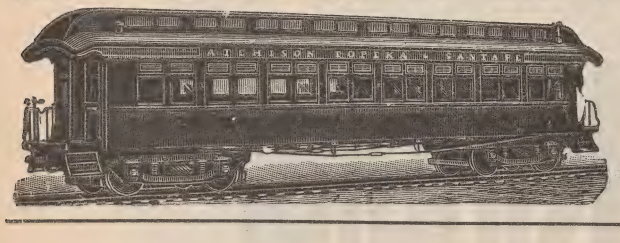

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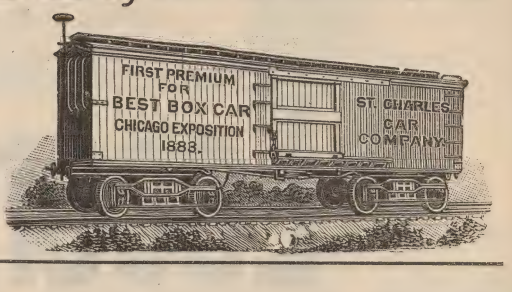

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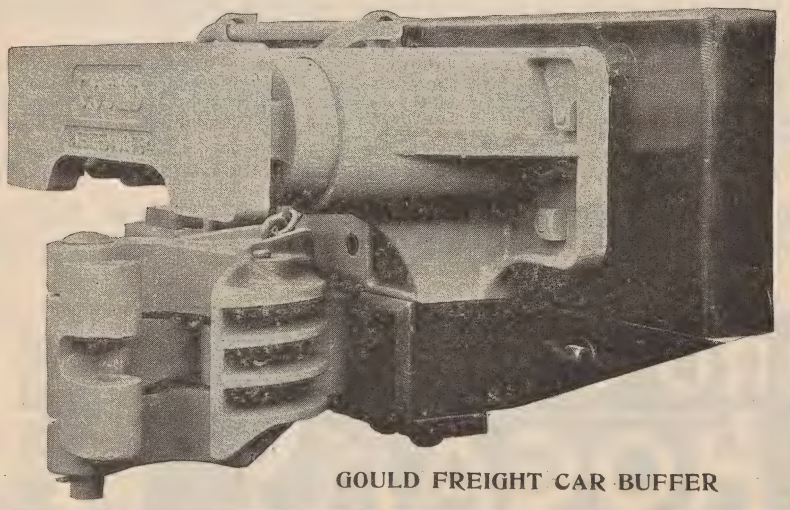

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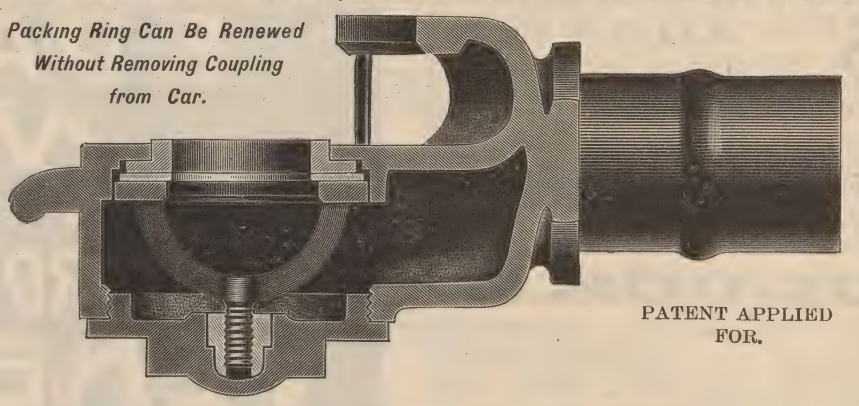

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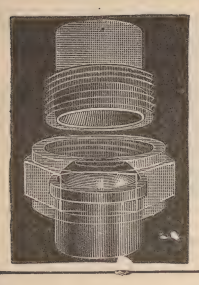

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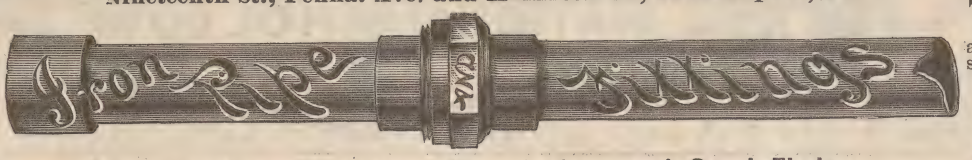

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The validity of this Patent has been judicially established in the case of

THE STANDARD PAINT CO. *vs.* Henry J. Bird and James L. Reynolds.

Where, after an exhaustive litigation extending over four and a quarter years, and after consideration of a printed record of upwards of one thousand pages, the Circuit Court of the United States for the District of New Jersey on July 5th, 1894, made and entered a decree adjudgingthat the Patent was valid and had been infringed by the Defendants, and directing an injunction against the defendants and an accounting.

The opinion of the Court, written by Hon. George M. Dallas, Circuit Judge, holds that the Patent covers any Paper coated with a solid residuum obtained from the distillation of petroleum, and that the manufacture and sale of any substantially similar Paper is an

INFRINGEMENT of the Patent.

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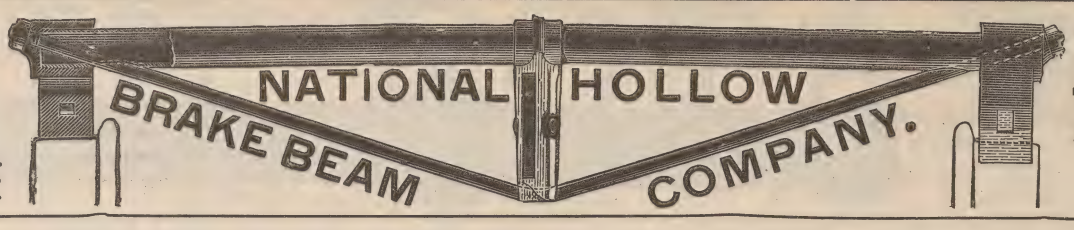

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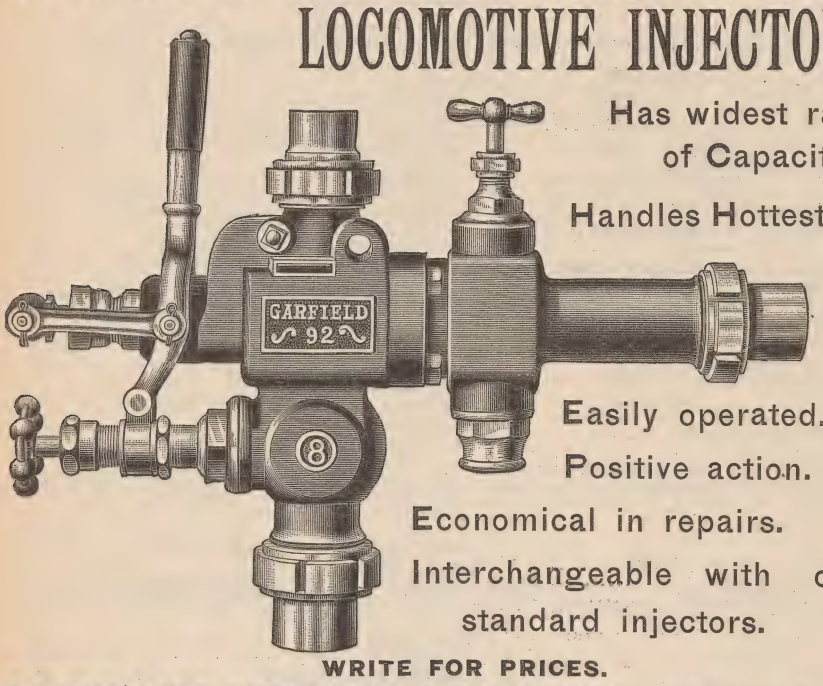

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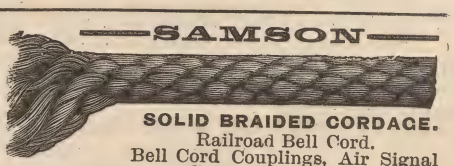
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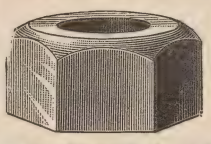
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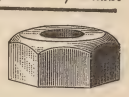
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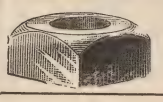
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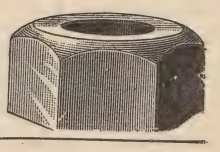

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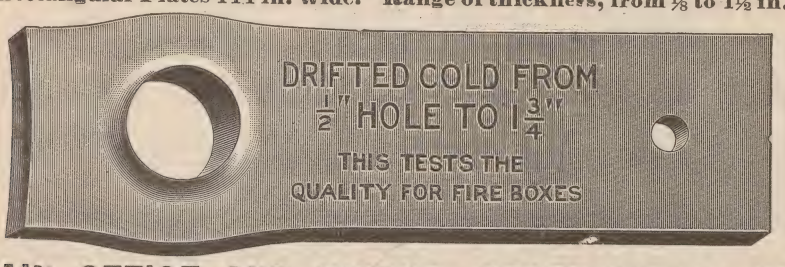

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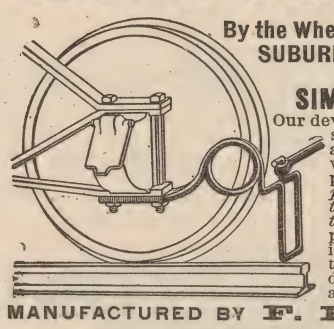

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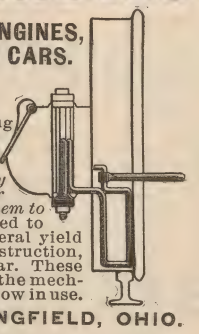

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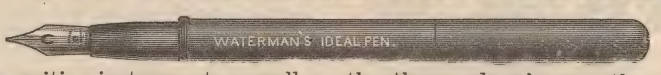

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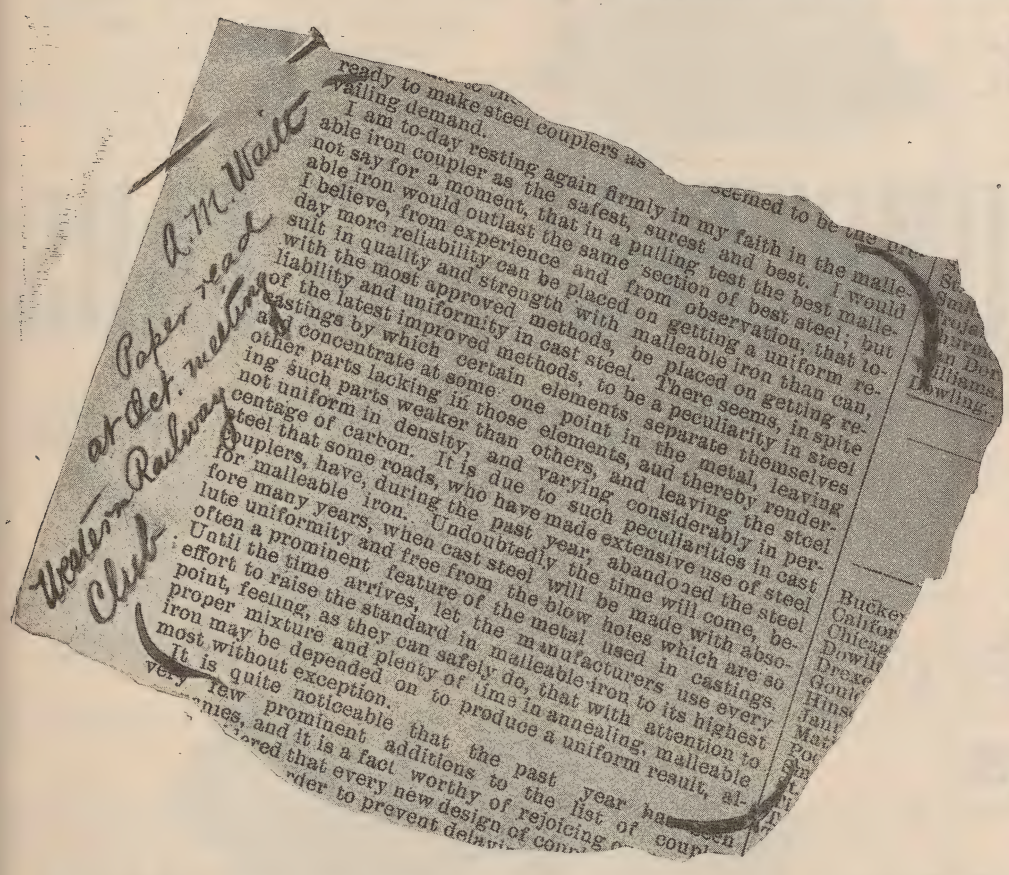

IT couples easily, smoothly and surely when the cars are brought together. Under no circumstances are repeated attempts necessary. Delays to trains and shocks to passengers and freight from this cause are entirely avoided.

In uncoupling, the lock itself throws the knuckle open, no separate piece of any kind being used The action of the lock in coupling and uncoupling is quick, positive and sure under all conditions.

STRENGTH. The bar of the TOWER Coupler is of malleable iron, the other parts being of steel. The whole coupler is so designed as to secure a maximum of strength.

In various tests made for us from September, 1893, to May, 1894, the results were highly satisfactory. On June 28 and July 25, 1894, Robert W. Hunt & Co. tested for us at the works of the Chicago Tire and Spring Co., our final form of the Tower Coupler. On Oct. 17–18, 1894, they tested at the same place on the same drop a number of couplers, in the presence of an invited company of railway officials. The purpose of the latter tests was to prove the superiority of one brand of steel over others and over malleable iron. The results of these tests have been widely published.

Selecting the "all steel" couplers which made the BEST records, they compare with the TOWER as follows :

Knuckle Tests.

Blows.	5 ft.	10 ft.	15 ft.	Material.
Chicago...	3	3	5	All Steel.
California.	3	3	4	All Steel.
Williams..	3	4	6	All Steel.
Tower ..	3	3	6	Malleable Bar, Steel Knuckle.

Guard-Arm Tests.

Blows.	3 ft.	5 ft.	10 ft.	Material.
Chicago...	3	3	2	All Steel.
California.	3	5	1	All Steel.
Williams..	3	2		All Steel.
Tower ..	3	4		Malleable Bar, Steel Knuckle.

Jerk Tests.

Blows.	5 ft.	10 ft.	15 ft.	Material.
Chicago...	3	3	1*	All Steel.
St. Louis..	3	1		All Steel.
Tower ..	3	3	3	Malleable Bar, Steel Knuckle.

*Broke yoke of machine.

Pulling Test.

In a pulling test of the Chicago and Gould Couplers, the lugs of the latter gave way at 139,750 lbs., and the former opened ¼ inch. Two Towers were pulled July 25th by Robt. W. Hunt & Co., and withstood a maximum load of 174,200 lbs. The lower lug and locking block of one Coupler then broke, the other Coupler remaining perfect.

The TOWER Coupler is thus proven under the drop to be fully equal to the strongest "all steel" Coupler made. It is giving corresponding results in actual service. And it is the easiest, surest and most perfect coupler made—combining strength and general efficiency to a remarkable degree.

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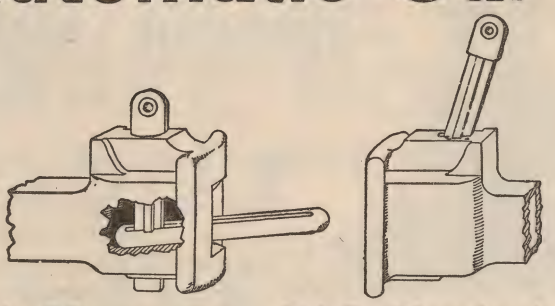

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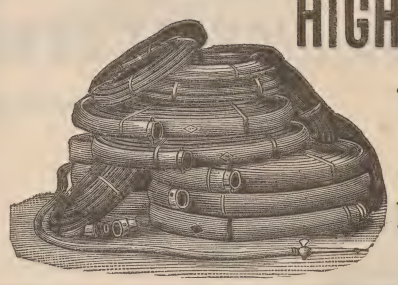

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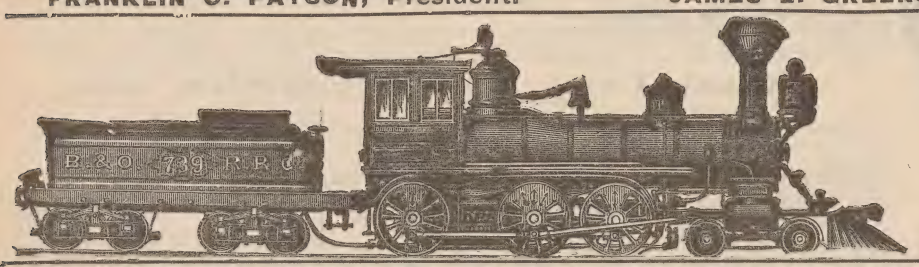

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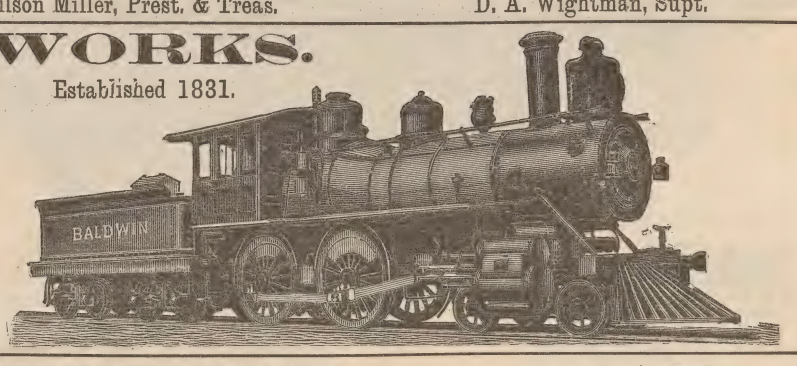

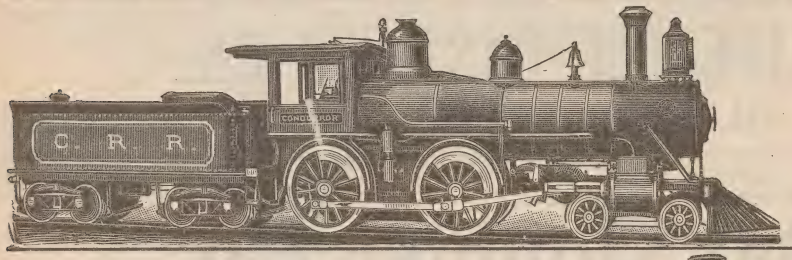

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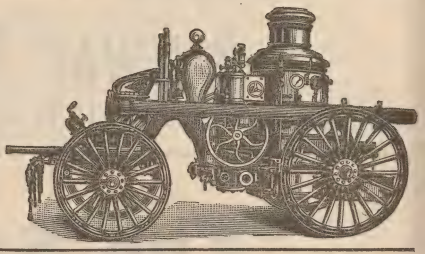

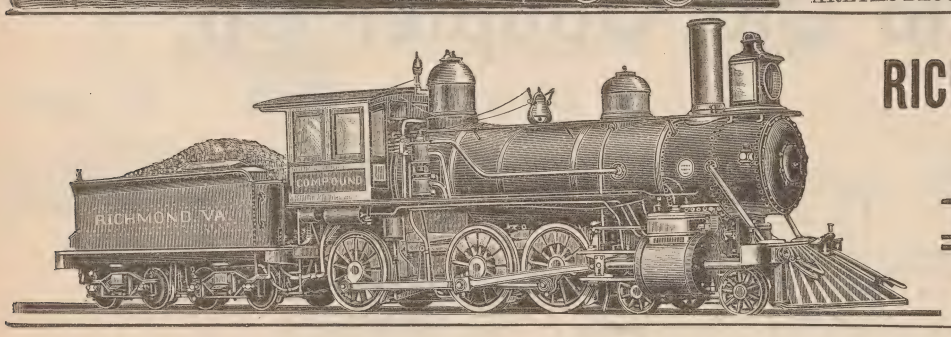

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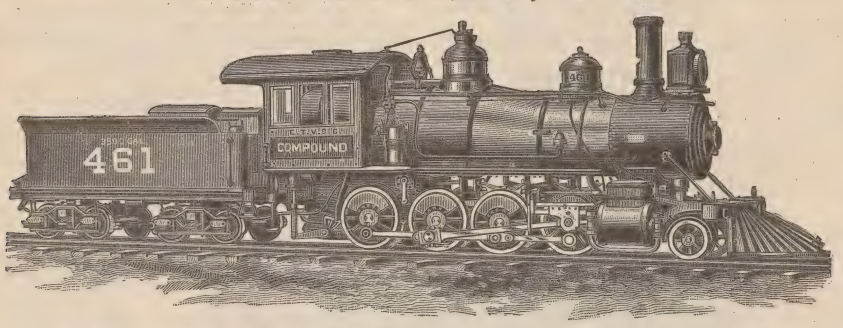

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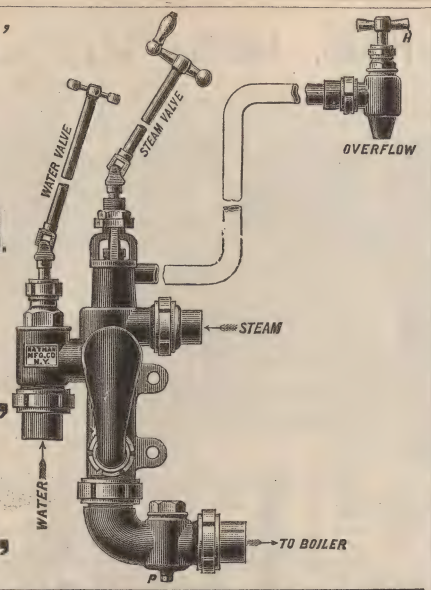

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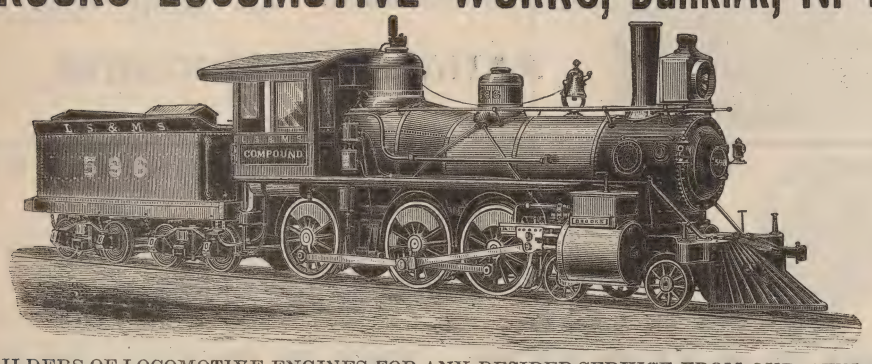

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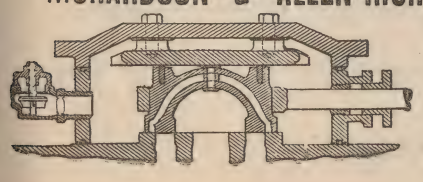

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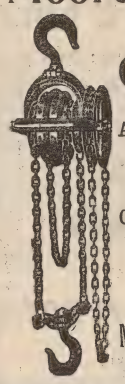

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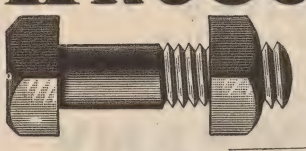

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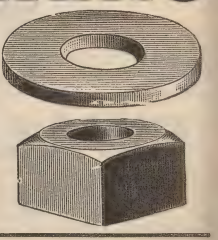

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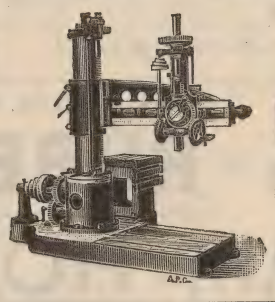

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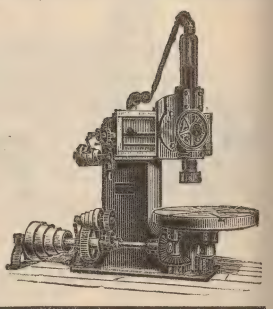

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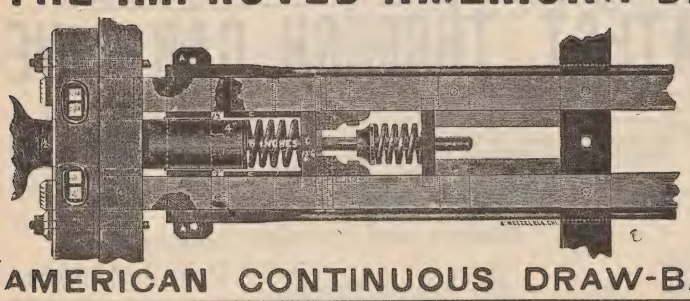

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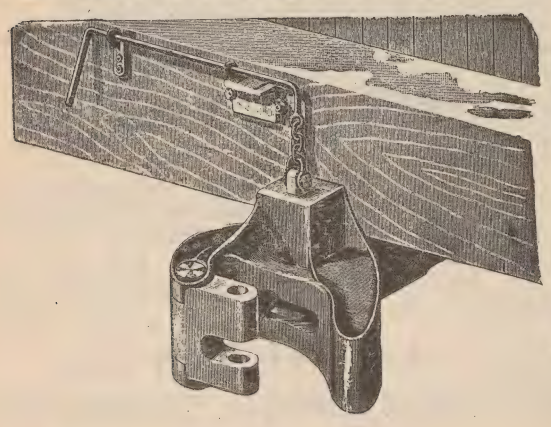

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J. G. Hopkins, Sec. & Treas......Clifton, Ariz.
Alabama Midland Ry. (See Plant System.)
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Albemarle & Raleigh R.R. (See Atlantic Coast Line)
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Arkansas Midland R. R. 4-8½ g. 74 m. 6 lo. 70 cars.
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R. Allen, M. M. & M. C. B ....Helena, Ark.
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Robt. Peebles, Pur. Agt.........Ashland, Ky.
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26 m. 6 lo. 16 pass. 40 frt. c.
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W. L. Guyton, M. M.......... Baltimore, Md
J. W. Allison, M. C. B......... Baltimore, Md.
Baltimore & Ohio R. R.
4-8½ g. 2,065 m, 896 lo. 28,973 cars.
R. B Campbell. Gen. Man.....Baltimore, Md.
G. B. Hazlehurst. G. Supt.M.P.Baltimore,Md.
L. J. Buckley, Pur. Agt... .Baltimore. Md.
A. J. Cromwell, Supt. M. P.,
Lines East of Ohio River, Baltimore, Md.
E. W. Grieves, Supt. Car Dept.Baltimore, Md.
Main Stem Div.:
S. B. Crawford, M. M...........Baltimore, Md.
J. M. Marsteller, M. M....Martinsburg,W.Va.
P. Hayden, M. M............Piedmont, W.Va.
G. C. Smith, Jr., M. M.........Grafton, W.Va.
Pittsg. Div.:
M. B. Cutter, Supt............ Pittsburgh, Pa.
I. N. Kalbaugh, M.M........ ..Glenwood, Pa.
Phil. Div.:
C. C. F. Bent, Supt..........Philadelphia, Pa.
Thos. Tresize, M. M..........Philadelphia, Pa.
Trans-Ohio Div.:
W. H. Harrison, Supt. M. P.......Newark, O.
Ohio Divs.:
J. M. Graham, Supt................Newark, O.
E. L. Weisgerber, M. M............Newark, O.
Akron & Wooster Branch Div.:
J. T. Johnson, Supt..................Akron, O
T. Taylor, M. M.... ...Chicago Junction,O.
Chicago Div.:
P. C. Sneed, Supt................Garrett, Ind.
J. Billingham, M. M..... ....Garrett, Ind.
Baltimore, & Ohio Southwestern R. R. Co.
4-8½g. 928 m. 194 lo. 6,896 c.
I. G. Rawn, Gen. Supt...... ....Cincinnati, O.
W.W. Peabody. G Man. & P.A.Cincinnati, O.
J. G. Neuffer, Gen. M. M........Cincinnati, O.
Bangor&Aroostook R. R. 4-8½ g. 189 m. 15 lo. 39 c.
F. W. Cram, Gen. Man. & P. A..Bangor, Me.
Orlando Stewart, Supt. M. P. & M.,
Oldtown, Me.
J. W. Comins, M. C. B... . Oldtown, Me
Bangor & Portland Ry. 4-8½ g. 50 m. 7 lo.59 c.
C. Miller, G. Man. & P. A..........Bangor, Pa.
G Holmes, M, M.................. Bangor, Pa.
Barclay R. R. 4-8½ g. 15 m. 5 lo. 25 c.
E. O. Macfarlane, Supt......... Towanda. Pa.
Bath & Hammondsport R. R. 4-8½g. 10 m.2 lo. 9 c.
H.S.Stebbins,Man.& P.A.Hammondsport,N.Y.
C. H. Griswold, M. C. B.Hammondsport,N.Y.
Bay of Quinte Ry. & Navigation Co.
4-8½ g. 85 m. 5 lo. 133 cars.
R. C. Carter, Gen. Man....... Deseronto, Ont.
F. S. Rathbun, Pur. Agt .....Deseronto, Ont.
Wm Evans, M. C. B ....Deseronto, Ont.
Beech Creek R. R. 4-8½ g. 185 m. 47 l. 2,887 c,
N. Y. C. & H. R., Lessee.
J. D. Layng, Gen. Man...New York City, N. Y.
A. G. Palmer, Supt. & P. A .Jersey Shore, Pa.
La Mott Ames, M. M ... .Jersey Shore, Pa.
A. L. Dravenstadt, M. C. B...Jersey Shore. Pa
Bellaire, Zanesville & Cin.Ry.Co. 3g.112 m 7 lo.197c.
J. K. Geddes, Gen.Man.&P.A....Zanesvile, O.
V. B. Stubbins, M. M............Zanesville, O.
Bellefonte Central. 4-9 g. 28 m 3 lo. 70 cars.
F. H. Thomas, Supt.... ......Bellefonte. Pa.
Robt. Frazer, Pur. Agt.... .Philadelphia, Pa.
Bellingham Bay & British Columbia Ry.
4-8½ g. 24 m 4 lo 60 cars.
C. L. Anderson, Gen. Man., Supt. & Pur. A.,
New Whatcom, Wash.
R. E. Nevins, M. M. & M. C. B.,
New Whatcom, Wash.
Bennington & Rutland Ry. 4-8½ g. 59 m. 12 lo. 327 c
E. D. Bennett, Supt.&Pur.Agt.Bennington, Vt.
Chas. J. McMaster, M. M. & C. B..Rutland,Vt.
Birmingham & Atlantic Ry. 4-8½ g. 35 m. 4lo.50 c.
G. A. Mathison, Gen. Supt. & Pur. A.,
Talladega, Ala.
J.J.Thomas, Jr., M. M.&M.C.B.Talladega,Ala
Birmingham, Sheffield & Tenn. River Ry.
4-9 g. 120 m. 11 lo. 563 cars.
Philip Campbell, G.M & Pur. A.Sheffield, Ala
Black Hills & Fort Pierre. 3 g. 40 m. 5 lo. 125 c
T. J. Grier, Gen. Man...... Lead City, S. D.
John A. Spargo, M. M......Lead City, S. D.
Bloomsburg & Sullivan.
4-9 g. 35 m. 5 lo. 25 cars.
F. M. Leader, Gen. Man .....Bloomsburg, Pa.
Boston & Albany R.R.
4-8½ g. 388 m. 249 lo. 7,612 c.
W H. Barnes, Gen. Man.. ......Boston, Mass.
Wm. H. Taft, Act.Supt. M. P.Springfield. Mass
F. D. Adams, Gen. M. C. B.......Allston, Mass.
T. W. Adams. For. C. Shop..... Allston, Mass.
Thos. B. Purvis, Div. M. M .. Boston, Mass.
C. H. Barnes, Div. M. M.... Springfield, Mass
J. B. Weston, For. Car Sh...Springfield, Mass.
J. E. Doran. For. Car Sh....East Albany, N. Y.
E. Priest, Div. M M.......East Albany, N. Y.
Boston & Lowell R. R. (Leased to Boston & Maine)
Boston&Maine R.R. 4-8½g. 1292,65m.570lo.11,614c.
Lucius Tuttle, Pres............. Boston, Mass.
T. A. MacKinnon, Gen.Man.... Boston. Mass.
J. A. Farrington, Pur. Agt.......Boston, Mass.
Henry Bartlett. Supt. M. P. & M.Boston, Mass.
A. B. Barrett, Div M. M .... Boston, Mass.
J. T. Chamberlain, M. C. B..... Boston, Mass.
Wor., Nash. & Port. Div.:
F. Barr, Supt............... ..Nashua, N. H.
C. L. Aiken, Div. M. M ...Worcester, Mass.
Southern Div.:
G. F. Evans, Supt.... ... ... Boston, Mass.
E. T. Sumner, Div.M. M.E. Cambridge, Mass.
Passumpsic Div.:
H. E. Folsom, Supt...........Lyndonville, Vt.
L. C. Todd, Div. M. M .. . Lyndonville, Vt.
Concord Div.: H. E. Chamberlain, Supt.,
Concord, N. H.
Chas. H. Wiggin, Div. M. M.Concord. N. H.
Conn. River Div.:
H. E Folsom, Supt.... ....Lyndonville, Vt.
W. H. Stearns, Div. M.M.Springfield. Mass
Boston & Providence R.R......(See Old Colony R. R.)
Boston, Revere Beach & Lynn R.R. 3 g.14 m.12 lo.53c.
J. A. Fenno Supt & P. Agt.....Boston, Mass.
R. D. Sutherland, M. M...... ...Boston, Mass.
John Coghlan, M. C. B... .. ....Boston, Mass
Bradford. Bordell & Kinzua R. R. 3 g.194m.6lo.150c
J. C. McKenna.Gen.Man. & P.A.Bradford, Pa
Brooklyn & Brighton Beach R. R.
4-8½ g. 15 m. 8 lo. 44 c. 8 frt. c.
Wm. Finley. Supt.& M. M....Flatbush. N. Y.
Brooklyn Elevated R.R. 4-8½ g. 20 m. 95 lo. 290 c.
J. D. Barton, Gen. Supt.........Brooklyn, N.Y.
E. P. Mallinson. M. M.........Brooklyn, N.Y.
Brunswick & Western R. R. (See Plant System.)
Buctouche & Moncton Ry. 4-8½g. 32m. 2 lo. 38c.
E. G. Evans, Gen. Man .... Moncton, N. B.
Jas. Carghlan, M. M.... .... Moncton, N. B.
F. N. Hall, Pur. Agt.... ......Moncton, N. B.
Buffalo, Attica & Arcade R. R. Co.
4-8½ g. 20 m. 1 lo. 2 c.
S. S. Bullis, Gen. Man...........Olean, N. Y.
G. W. Conklin, G.S., P.A.,M. M. & M. C. B.,
Attica, N. Y.
Buffalo, Rochester & Pittsburg Ry.
4-8½g. 355 m. 135 lo. 7,246 c.
R. G. Matthews, Gen.Supt.....Rochester,N.Y.
G. E. Merchant, Pur. Agt...Rochester, N. Y.
C E. Turner, Supt. M. P .....Rochester. N. Y.
F. G. Lauer, M. M.... ......Rochester, N. Y.
M. C. B.............Buffalo, N. Y.
Buffalo & Susquehanna Ry.
4-8½ g. 75 m. 10 lo. 1,150 cars.
G. W. Goodyear, Gen. Man...Buffalo, N. Y.
E. A. Cheney, Pur. Agt.... ......Austin, Pa
S. W. Huston, M. M.... .... Austin, Pa.
Burlington & Mo. Riv. R. R.(in Neb.) (See C.,B.&Q.).
Burlington & North-West'n and Bur.& West'n Rys.
4-8½ g. 123 m. 7 lo. 397 c.
Robt. Law, Man. & P. A........Burlington,Ia.
Adam Metz, M. M..............Burlington, Ia
Burlington, Cedar Rapids & Northern Ry.
4-8½ g. 1,135 m. 119 lo. 4,608 cars.
C. J. Ives, Pres............ ..Cedar Rapids,Ia.
Robt. Williams, Gen. Supt....Cedar Rapids, Ia.
W. J. Morrison, Pur. Agt. .Cedar Rapids, Ia.
R. W. Bushnell, M. M........Cedar Rapids, Ia.
G. S. Dickover, M. C. B ....Cedar Rapids, Ia.

C

Camden & Atlantic R. R. ....(See Penna. R.R.)
Canada Atlantic Ry. 4-8½ g. 618 m. 25 l. 1,779 c.
E. J. Chamberlin, G.M.&P.A...Ottawa, Ont.
M. Donaldson, Supt. & M. M....Ottawa, Ont.
Canadian Pacific Ry.
4-8½ g. 6, 181 m. 615 lo 675 pass. 15,769 frt. c.
W. C. Van Horne, Pres ...Montreal, Can.
R. Atkinson, Act. M. M ....Montreal, Can.
John Higginson, M. C. B ....Montreal, Can.
A. C. Henry, Pur. Agt..... ....Montreal, Can.
Atlantic Div.:
H. P. Timmerman, Supt......St. John, N. B.
.......McAdam, N. B.
E. Div.: C. W.Spencer, Gen. Supt. Montreal, Can.
George Preston, M. M.........Farnham, Que.
W. Div.: Wm. Whyte, Gen.Supt. Winnipeg, Man.
W. Cross, M. M.... ....Winnipeg, Man.
O. & Q. Div.:
J. W. Leonard, Gen. Supt.....Toronto, Ont.
George McKinnon, M. M.......Toronto, Ont.
G. S. Mackinnon, M. M.........Farnham, Que.
Pac. Div.: H. Abbott, Gen. Supt. Vancouver, B.C
L. R. Johnson, M. M.......Vancouver, B. C.
Cape F'r & Yadkin V.R.R.4-9 g. 338 m.24 lo. 617 c.
John Gill, Rec........ ....Baltimore, Md.
J. W. Fry, Gen.Man.&P. A..Greensboro,N. C.
I. W. Clark, M. M..........Fayetteville, N. C.
Carolina Central. 4 g. 267 m. 24 l. 354 c.
J. C. Winder. Gen. Man ......Portsmouth Va
L. T. Myers, Gen.Supt.&P.A.Portsmouth. Va.
Carolina Midland R. R 4-8½ g. 55 m. 4 lo. 29 cars.
J. C. Keys, Gen. Supt........Charleston, S. C.
W. T. Withington. M.M..... Blackville, S. C.
Carrabelle Tallahassee & Georgia R. R. 50 m.
J.A.McDuffie, Gen. Supt.; S.D. Chittenden, Pur A.;
S. A. Sheppard, M. M., all Tallahassee, Fla.
Carson & Colorado. 3 g. 299 m. 8 lo. 227 cars.
H. M. Yerington, P. & G. S. Carson City, Nev.
Hume Yerington, Pur. Agt..Carson City, Nev.
W. L. Wolley, M. M...........Hawthorne, Nev.
C. A. Brulin, M. C. B..... , Carson City, Nev.
Carthage & Adirondack Ry.
(See N. Y. C. & H. R. R. Co.
Central Branch Union Pac. (See Mo. Pac.; (3) Div.)
Central New York & Western R. R.
4-8½ & 3 g, 46 m. stand.& 18m.narrow g. 11 lo. 91c.
M. S. Blair, Gen. Supt.... Hornellsville, N. Y.
L. B. Heers, M. M..... ..... Angelica, N. Y.
Central Ontario Ry. 4-8½ g. 104 m. 8 lo. 125 c.
Geo. Collins, Gen. Supt.& P.A..Trenton, Ont.
D. Duff, M. M.& M.C. B..........Trenton. Ont.
Central Pac. R. R. (See Southern Pacific Co.
Central Penn. & Western R.R. 4-9 g. 31 m.2 lo.10c
S. B. Haupt, Gen. Man. Watsontown, Pa.
Central R. R. & Banking Co. of Georgia.
4-9 g. 2,025 m. 265 lo. 6,008 cars.
H. M. Comer, Pres........... ..Savannah, Ga.
T. D. Kline, Gen. Supt.. ......Savannah, Ga.
J. W. Comer. Pur. Agt...........Atlanta, Ga
T. B. Irwin, M. M .. ..Savannah, Ga.
So.-West'n Div.: B.C.Epperson, Supt.Macon,Ga.
F. H. McGee, M. M..................Macon, Ga.
J. L. Whitsitt, M. M........... .. Columbus, Ga.
So. Car. Div.: J. H. Stubb, M. M..Augusta, Ga.
Central R.R. of New Jersey.
Operating Cumb. & Maurice River and Lehigh & Lackawanna roads. 4-8½ g. 628 m. 442 l. 29,780 c.
J. H. Olhausen, Gen. Supt..Jersey City, N. J.
G. D. W. Smith, Pur. Agt.. Jersey City, N. J.
C. A. Thompson, Supt. M. P.Jersey City, N. J.
N. J. Cent. Div.:
W. H. Peddle, Supt...........Jersey City, N.J
W. L. Hoffecker, M. M..Elizabethport, N. J
N. J. South. Div.:
W. V. Clark, Supt...... ....Long Branch, N. J
W. Montgomery, M. M.... .. Manchester,N.J
L. & S. Div.:
G. W. Twining, Supt.& M.M.Mauch Chunk,Pa.
Central R. R. of S. C. (See Atlantic Coast Line.)
Central Texas & N'w'n R. R. (See Hous. & Tex. Cen
Central Vermont R. R. 4-8½ g.796 m. 200 lo. 4,314 c
F. W. Baldwin, Gen.Supt.... St. Albans, Vt
W. B. Hatch, Pur. Agt ....St. Albans, Vt
C. E. Fuller, Jr., Supt. M. P...St. Albans, Vt
W. J. Robertson, M. C. B.... .St. Albans, Vt
Rut. Div.: J. Burdett, Supt.........Rutland, Vt.
G. W. Kinney, M. M...... ......Rutland, Vt.
New London No'n R. R. 121 m, 24 lo 382 c
D. Mackenzie, Supt...............N. London, Ct.
J. Hinchy, M. M.... ...... New London, Ct.
L. Beckwith, M. C. B ......New London. Ct.
Og. & L. Cham. Div.: 4 8½g.118m.28 l. 1,583 c.
Frank Owen, Supt..........Ogdensburg, N Y.
Thos. Rumney, Div. M. M......Malone, N. Y.
Charleston & Savannah (See Plant System.)
Charleston, Sumt. & No. R.R. 4-9g.150m.12 lo.306c
C. Millard, Supt.................. Sumter, S. C.
E. M. Raynor, M. M............Sumter S. C.
Charlotte, Columbia & Augusta R.R. (See S. Ry. Co.)
Chattanooga Southern Ry. 4-8½g. 92 m. 5 lo. 124 c.
J. W. Burke, Rec.& Man.Chattanooga, Tenn.
H. T. Ellison, M. M.......Chattanooga, Tenn.
H. P Eager, Pur. Agt ....Chatt, Tenn.
Chat., Rome & Colum. Ry. 4-9 g. 138 m. 9 lo. 79 c.
E. E. Jones, Rec. & Pur. Agt......Rome, Ga.
W. A. Love, M. M. & M. C. B.....Rome, Ga
Chateaugay R. R. 3 g. 73 m. 11 lo. 514 cars.
J. N. Stower, Gen. Man.........Plattsburg,N.Y.
M. L. French, Supt.& P.A..Plattsburg, N. Y.
J.M.Davies, M.M.&M.C.B.Lyon Mountain,N.Y.
Chesapeake & Nashville
4-9 g. 35 m. 3 lo. 45 ft. 2 pass. cars.
Gen. John Echols, Gen.Man. .Louisville, Ky.
Chesapeake & Ohio Ry.4-8½ g.1,362 m.359 l.13.741c.
Geo. W. Stevens, Gen. Man... Richmond, Va.
W. F. La Bonta, Pur. Agt ....Richmond, Va.
W. S. Morris. Supt. M. P......Richmond, Va
T. S. Lloyd. M. M.......... ....Richmond, Va.
A. F. Stewart, M. M......Huntington. W. Va.
C. Quandt. M. M ... .Covington. Ky.
Chesapeake, Ohio & Southwestern Ry. Co. and Ohio Valley Ry. Co.
John Echols, Gen. Man......... Louisville, Ky.
F. D. Thompson, Gen. Supt....Louisville, Ky.
S. R. Tuggle. Supt. M. P......Paducah, Ky.
Wm. P. McDowell, Pur. Agt..Louisville, Ky.
Chester & Lenoir Ry. 3 g. 110 m. 6 lo. 92 cars.
L. T. Nichols, Gen. Supt.&P.A..Chester,S.C.
J. S. Cothraup, Jr., M. M......Chester, S C.
S. D. Scarborough, M C. B .Chester, S. C.
Chicago & Alton R.R. 4-8½ g. 850 m. 240 lo.7,800c.
C. H. Chappell, Gen Man. ....Chicago. Ill.
A. V. Hartwell, Pur. Agt....... .Chicago. Ill
J. Johann, S. Mch .... Bloomington, Ill.
J. Townsend, M.C.B............ Bloomington. Ill
Chicago & Erie R.R. (See N. Y., L. E. & W. Ry
Chicago & Eastern Illinois R. R.
4-8½ g. 502 m. 138 lo. 8,780 c.
E. P. Broughton, Supt ....Chicago, Ill.
G. J. Schappert. Pur. Agt.........Chicago, Ill.
Allen Cook, S. M. P......... .. .. Danville, Ill.
J. J. Curtis, Div. M. M..........Danville, Ill.
Chicago, Ft. Madison & Des Moines R. R.
4-8½ g. 71 m 3 lo. 28 c.
E. F Potter, Gen. Man.&P.A.Ft. Madison, Ia.
Chicago & Gr. Trunk and Det., Gr. Haven & Mil. Ry ; Cincinnati, Saginaw & Mackinaw R. R.; Toledo, Saginaw & Muskegon R. R.
4-8½ g. 524 m. 206 lo. 3,883 cars.
W. J. Spicer, Gen. Man. .... Detroit, Mich.
J. S. Lorimer, Gen. StoreKeeper.Detroit,Mich.
H. Roberts, Mech. Supt..........Detroit, Mich.
T. Sutherland, Asst. Car. Supt..Ft. Gratiot, Mich.
J. A. Slack, Asst. Mech. Supt. Battle Creek, Mich.
Chicago & Iowa R.R. (See C., B. & Q.
Chicago & Northwestern Ry.
4-8½ g. 5,006.13 m. 1,018 lo. 35,613 cars.
John M. Whitman, Gen. Man......Chicago. Ill
Chas. Hayward, Pur. Agt..........Chicago, Ill.
Robt. Quayle, Supt. M. P. & M...,Chicago, Ill
C. A. Schroyer, S. C. D........ ...Chicago. Ill
Wis. Div.: W. A. Gardner, Supt.... Chicago, Ill.
J. Heath, M M..... .... Chicago, Ill.
Gal. Div.: J. C. Stuart, Supt..........Chicago, Ill.
R. Erkshine, M. M.................Chicago, Ill.
Penn. Div.: W.B. Linsley. Supt. Escanaba, Mich.
J. W. Clark, M. M...... .....Escanaba, Mich.
Mad. Div.: R. A. Cowan, Supt.... Baraboo, Wis.
H. D. Page, M. M................ Baraboo. Wis.
W. & St. P. Div.:
W. P. Cosgrove, Supt... ....Winona, Minn,
Wm. McIntosh, M. M ....Winona. Minn.
Ia. Div.: P. Hallonbeck, Supt.........Boone, Ia.
J. Cockfield, M. M.... ....Clinton, Ia.
No. Iowa Div.: H M Hughes, S.. Eagle Grove, Ia.
Wm. Hutchinson Foreman...Eagle Grove, Ia
Ashland Div.:
G. F. Bidwell, Supt.............Kaukauna, Wis.
M. M...........Kaukauna, Wis.
Chicago & Ohio River R R. 4-8½ g. 80,957 m.3lo.6c
E. O. Hopkins, G. M....... ...Evansville, Ind.
H. W. Matters, Pur. Agt ... ...Princeton, Ind
C. C. Robinson, M. M. & C. B...Mattoon, Ill.
Chicago, Peoria & St. Louis Ry.
4-8½ g. 225 m. 38 lo. 1,867 cars.
C. H. Bosworth, G. M. & Rec..Springfield, Ill.
F. C. Dodds, Pur. Agt.........Springfield, Ill.
W. J. Hemphill, M.M.&M.C.B.Springfield, Ill.
Chicago & West. Michigan.
4-8½ g. 564 m. 76 lo. 2,901 cars.
Chas. M. Heald. G. M.... GrandRapids, Mich.
Russell Wallace, Pur. Agt. Grand Rapids, Mich.
B. Haskell. S. M. P ....Grand Rapids, Mich
W. K. Christie, M. M ....Muskegon, Mich
......Muskegon, Mich.
Chicago, Bur. & Kan. City Ry. (See C., B. & Q.
Chicago, Burlington & Northern
4-8½ g. 371 m. 58 lo. 3,420 c.
J. R. Hastings, Supt...... ....St. Paul, Minn.
Geo. Hargreaves, Pur. Agt........Chicago, Ill.
W. H. Lewis. M. M.............La Crosse, Wis.
Chicago, Burlington & Quincy R R
4-8½ g. 2,176 m. 547 lo. 24,078 cars.
C., B. & Q., East of Mo. Riv:
W. F. Merrill, Gen. Man.... ....Chicago, Ill.
Geo. Hargreaves. Pur. Agt........Chicago, Ill.
G. G. Yeomans. Asst. P. A...... Chicago, Ill
G. W. Rhodes, Supt M. P.........Aurora, Ill
W. Forsyth, Mech. Eng.......... Aurora, Ill.
R. D. Smith, M. M................Chicago, Ill
Chi. Div.: H. D. Judson, Supt.... ....Aurora, Ill
A. Forsyth, M. M.. ....Aurora, Ill
Galesburg Div.:
W. B. Throop, Supt...........Galesburg, Ill.
R. W Colville, M. M..........Galesburg, Ill.
St. L Div.: W. G. Besler, Supt. Beardstown, Ill.
C. W. Eckerson. M. M .....Beardstown, Ill.
Ia. & Mo. Lines.: C.M.Levey, Supt.Burlington,Ia
J. West. M. M..............W. Burlington, Ia.
East. Div.: O. E. Stewart. Supt.. Ottumwa, Ia.
J. F. Deems, M. M... .... Ottumwa, Ia
Joel West, M. M... .... West Burlington, Ia.
West'n Div.: J.H. Duggan, Supt....Creston, Ia.
E. Jones. M.M ... .Creston, Ia.
Bur. & Mo. R. R. in Neb.:
4-8½ g. 3,510.7 m. 329 lo. 9,214 cars.
G. W. Holdrege, Gen. Man.......Omaha. Neb.
D. Hawksworth. Supt. M. P. Plattsmouth. Neb.
E. S. Greusel, M. M ....Havelock, Neb.
R. T. Smith, M. M.... ....Lincoln, Neb.
A. B. Pirie, M. M .. ..Wymore, Neb
R. B. Archibald. M. M....... .McCook. Neb.
J. P. Reardon, M. M. .... Alliance. Neb.
Chicago, Iowa & Dakota Ry. 4-8½ g. 27 m. 2 l. 17 c
W. S. Porter, Gen. Man.&Pur.A....Eldora, Ia
Chicago, Kalamazoo & Saginaw Ry.
4-8½ g. 45 m. 4 lo. 15 cars.
W. S. Dewing, Gen. Man....Kalamazoo, Mich.
H. C. Potter, Pur. Agt. ....Kalamazoo Mich.
Chicago, Milwaukee & St. Paul Ry.
4-8½g. 6,154m. 852 lo. 28,965 cars.
A. J. Earling, Gen. Man..........Chicago, Ill.
J. T. Crocker, Pur. Agt ....Chicago, Ill.
J. N. Barr. Supt. M. P. & C. D. Milwaukee, Wis.
A. E. Manchester, A. S. M.P. Milwaukee, Wis.
Geo. Gibbs, Mech. Eng. .. ... Milwaukee. Wis.
J. J. Hennessey. M. C. B. .Milwaukee, Wis.
Chicago & Milw., Chicago & C. B. and Chicago Evanston Divs.:
J. B. Cable, Supt....... .. ..Chicago, Ill.
C. & C. B. Div. in Ia.: C. A. Goodnow, Supt., Marion, Ia.
Kansas City Div.:
J. F. Gibson, Supt.............Kansas City, Mo.
La Crosse Div.:
D. C. Cheney, Supt ....Milwaukee, Wis.
P. du Chien & Min. Point Div.:
W. W. Collins, Supt .... Milwaukee, Wis.
Northern Div.: J. M. Bunker, Supt. Milwaukee, Wis.
Dubuque Div.: J. W. Stapleton, S..Dubuque, Ia.
Geo. H. Brown, M. M............Dubuque, Ia.
John Taylor, M. M.... ....Minneapolis, Minn.
James River Div.:
J. H. Foster. Supt...........Aberdeen, S. D.
Chicago, Rock Island & Pac. Ry.
4-8½ g. 3,574 m. 564 lo. 16,329 cars.
W. H. Truesdale. Third V. P.... Chicago, Ill.
F. A. Marsh, Pur. Agt.............Chicago, Ill.
Geo. F. Wilson, S. M. P...... ....Chicago, Ill.
Lines East of Missouri River:
Ill. Div.: C. L. Nichols. Supt.....Blue Island, Ill
J. W-Fitzgibbon, M. M...... ...Chicago, Ill.
A. Childs, M. C. B...............Chicago, Ill.
Ia. Divs.: W. H. Stillwell, Supt..Des Moines, Ia.
A. L. Studer, M. M................Stuart, Ia.
Des.M.Val.Div.: C.N.Gilmore, Supt. Des Moines, Ia.
J. B. Kilpatrick, M. M....Valley Junction, Ia.
So.-Wn. Div.: H. A. White, Supt...Trenton, Mo.
W. Gessler, M. M........ ......Trenton, Mo.
Lines West of Missouri River:
H. Monkhouse, A. S. M. P... Horton, Kan.
Chicago, St. Louis & Pittsburgh R.R. (See Penn Co.)
Chicago Great Western Ry
4-8½ g. 922 m. 147 l. 5,082 c.
Samuel G. Stickney, Gen. Man. St. Paul, Minn.
J. Warwick, Pur. Agt......... ..St. Paul, Minn.
Tracy Lyon, Supt. M. P....... St. Paul, Minn.
A. N. Hayes, M. C. B........ St. Paul. Minn.
C. E. Slayton, Div. M. M .....Oelwein, Ia.
Chicago, St.Paul, Minneapolis & Omaha Ry.
4-8½ g. 2,015 m. 270 lo. 9,604 cars.
E. W. Winter, Gen. Man. . ..St. Paul, Minn.
W. H. S. Wright, Pur. Agt.. ...St. Paul. Minn.
J. J. Ellis, M. M. . . ..St. Paul, Minn.
H. L. Preston, M. C. B.. .. ..Hudson, Wis.
Chicago & Southeastern Ry. 4-8½ g. 76 m.7 lo.125 c.
H. Crawford, Jr., Gen. Man. & Pur. Agt.,
Anderson, Ind.
J. W. Roberts, M M.& M C.B .Lebanon. Ind.
Chicago & Texas Ry. Co.
4-8½ g. 55 m. 10 lo. 244 cars.
O. L. Garrison, V. P. & G. M. St. Louis, Mo
S. L. Sherer, Pur. Agt.........St. Louis, Mo.
J. W. Lewis, M. M.&M.C.B..Murphysboro, Ill.
Chicago & Western Indiana R. R. Co. and The Belt Ry. Co. of Chicago.
4-8½ g. 55 m. 45 l. 100 cars.
B. Thomas, Pres. & Gen. Man..Chicago, Ill.
C. C. Nash, Pur Agt.... ....Chicago, Ill.
P. H. Peck, M. M..................Chicago, Ill.
Choctaw, Oklahoma & Gulf Ry.
4-8½ g. 95 m. 6 lo. 1,035 cars.
J. D. Bradford, Gen. Man. So. McAlester, I.T.
Geo. Minch, Pur. Agt .. So. McAlester, I.T.
J. Cunningham, M. M ... So. McAlester, I. T.
Cincinnati & Kentucky Southern Ry.
4-8½ g. 13 m. 2 lo.51 c.
E. Ritchie, Gen Man.& P. A....Cincinnati, O.
W. L Peairs, M. M.. ....Yosemite, Ky.
Cin. & Muskingum Valley Ry.
4-9 g. 148.5 m. 20 l. 414 c.
C. M. Bennett, Supt... ....Zanesville,O.
H. O. Hukill, Pur. Agt .....Pittsburgh, Pa.
Wm. Meikle, Genl. For. Shops....Lancaster,O.
Cincinnati & Northwestern Ry.
4-8½ g. 14 m. 2 lo. 40 cars.
R. Simpson Gen.Man.&Pur.Agt.Cincinnati,O.
O. K. Simpson, M. M ....Cincinnati, O.
Cincinnati & Westwood R. R. 4-8½ g. 9 m.2 lo. 9 c,
J. N. Gamble, G. M., S. & P. A..Cincinnati, O.
Cin., Georgetown & Portsmouth. 3 g. 42 m. 5 lo. 75 c.
E. W. White, G. M. & Pur. Agt..Cincinnati,O.
J. M. Myers, Supt........... ..Cincinnati, O.
P. T. Dunn, F. of Shops&M. C. B. Cincinnati, O
Cincinnati, Hamilton & Dayton; Dayton & Mich.: Cin., Ham. & Ind.; Cincinnati, Dayton & Ironton R. R.; Cincinnati, Dayton & Chicago R. R.; Columbus, Findlay & Northern; Bowling Green, Cincinnati & Dayton R. R's.
4-8½ g. 622 m. 167 l. 8,101 cars.
Wm. M. Green, Gen Man......Cincinnati, O.
G. R. Balch, Pur. Agt. ....Cincinnati, O.
C. H. Cory, Supt. M. P............. Lima, O.
Wm. Hassman, Div. M. M..........Dayton, O.
J. M. Percy, Div. M. M...........Cincinnati, O.
Cincinnati, Jackson & Mackinaw R. R.
4-8½ g. 285 m. 29 lo. 1,470 cars.
F. B. Drake, Rec., Gen. Man.&P.A. Toledo, O.
A. H. Watts, M. M...... ....Marshall, Mich.

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STANDARDS ADOPTED BY THE MASTER CAR BUILDERS' AND MASTER MECHANICS' ASSOCIATIONS.
CODE OF RULES GOVERNING THE CONDITION OF AND REPAIRS TO FREIGHT AND PASSENGER CARS.

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MORSE BUILDING, NEW YORK.

Cin., Leb. & North. Ry. 4-8½ & 3 g. 38 m. 5 l. 46 c.
Geo. Hafer, Gen. Man. & P. A ...Cincinnati, O.
Jos. Underwood, M. C. B. ......Cincinnati, O.
Cincinnati, New Orleans & Texas Pacific Ry. Co. (See Q. & C.)
Cincinnati, Portsmouth & Virginia R. R.
4-8½ g. 130 m. 10 l. 183 cars.
Sam'l Hunt, Pres. & Gen. Man Cincinnati, O.
T. Hunt, Pur. Agt.......... Cincinnati, O
John C. Homer, M. M. & M. C. B. Portsmouth, O.
Cincinnati, Richmond & Chi. R. R. (See C., St. L. & P.)
Cincinnati, Saginaw & Mackinaw R. R. (See C. & G. T. Ry. Co.)
Cin., Wabash & Mich. Ry. (See C., C., C. & St. L. R. R.
Clarendon & Pittsford Ry. 4-8½ g. 12 m. 3 l. 113 c.
F. D. Proctor, Gen. Mgr..........Proctor, Vt.
G. H. Davis, M. M................Proctor, Vt.
E. J. Boyce, Pur. Agt............Proctor, Vt.
Cleveland, Akron & Columbus Ry.
4-9 g. 177 m. 42 lo. 2,946 cars.
Geo. W. Saul, Pres. & Gen. Man..Cleveland, O.
W. J. Vance, M. M. & M. C. B..Mt. Vernon, O.
Cleve., Cant. & South. R. R. 4-8½g. 210m. 37 l. 3,003 c.
J. W. Wardwell, Rec. & Man.. Cleveland, O.
John Bean, M. M. & Pur. A.......Canton, O.
H. A. Kennedy, P. A...............Canton, O.
Cleveland & Marietta Ry. 4-8½g. 105 m. 23 l. 1,008 c.
W. A. Baldwin, Pres., G. M. & P. A. Cambridge, O.
J. Glasser, M. M.............Cambridge, O.
Cleveland & Pittsburgh. (See Penna. Co.)
Clev., Cinn., Chi. & St. Louis:
4-8½ g. 2,300 m. 455 lo. 2,007 cars.
C. E. Schoff, Asst. Gen. Man....Cincinnati, O.
A. M. Stimson, Pur. Agt ....Cincinnati, O.
William Garstang, Supt. M. P. Indianapolis, Ind.
Cinn.-Sandusky Div.:
W. Gibson, Supt.............Springfield, O.
James A. Keegan, M. M........ Delaware, O.
Clev. & Indianapolis Div.:
T. J. Higgins, Supt...............Cleveland, O.
E. E. Hudson, M. M......... Bellefontaine, O.
St. Louis Div.:
E. M. Neel, Supt..................Mattoon, Ill.
G. S. McKee, M. M ....Mattoon, Ill.
Chicago Div.:
G. W. Bender, Supt.........Indianapolis, Ind.
F. M. Lawler, M. M...........Brightwood, Ind.
Cairo Div.:
W. P. Orland, M. M. ....Mt. Carmel, Ill.
P. & E. Ry.: J. A. Barnard, Gen. Man...Urbana, Ill.
J. McClurg, M. M................Urbana, Ill.
Mich. Div.: S. T. Blizard, Supt....Wabash, Ind.
C. H. Doedler, M. M...........Wabash, Ind.
Cleveland, Lorain & Wheeling Ry.
4-8½ g. 192 m. 59 lo. 4,025 cars.
W. R. Woodford, Gen. Man.... Cleveland, O.
F. E. Now, Pur. Agt..........Cleveland, O.
James Graham, M. M............. Lorain, O.
F. H. Stark, M. C. B.................Lorain, O.
Colorado Eastern R. R. Co. 3 g. 17 m. 2 lo. 13 cars.
C. M. Wicker, Gen Man...........Denver, Col.
R. McDowell, Gen Pur. Agt.. ...Denver, Col.
H. Twining, M. M. & M. C. B.....Denver, Col.
Colorado Midland Ry. 4-8½g. 233 m. 51 l. 1,415 c. (See A., T. & S. F. Rd.)
Columbia & Greenville R. R. .....(Rich. & Danville.)
Columbia & Puget Sound R.R. 3 g. 62 m. 10 lo. 200 c.
C. J. Smith, Gen. Man.........Seattle, Wash.
W. E. Nichols, Pur. Agt.........Seattle, Wash.
D. O'Leary, M. M. & M. C. B ...Seattle, W. T.
Columbus Southern. 4-9 g. 88 m. 5 lo. 106 cars.
S. F. Parratt, Gen. Man........Columbus, Ga.
H. C. Hill, Gen. Supt, & Pur. Agt. Columbus, Ga.
J. McC. Hill, M. M..............Columbus, Ga.
Columbus, Sandusky & Hocking Ry.
4-8½ g. 160 m. 29 lo. 3,342 c.
F. J. Picard, Gen. Man. & P. A. Columbus, O.
G. C. Hoover, Pur. Agt........Columbus, O.
Geo. F. Gardiner, M. M. & M. C. B. Columbus, O.
Columbus & Rome R. R. (See Cent. of Ga.)
Columbus, Hocking Valley & Toledo Ry.
4-8½ g. 325 m. 109 lo. 7,845 cars.
C. B. Duffy, Pur. Agt..............Columbus, O.
S. S. Stiffey, M. M ....Columbus, O.
Colusa & Lake R. R. 3 g. 22 m. 3 lo. 30 cars.
E. A. Harrington, Man., Supt. & P. A. Colusa, Cal
M. E. Burrows, M. M ....Colusa, Cal.
T. Sullivan, M. C. B...............Colusa, Cal.
Concord & Montreal R. R.
4-8½ g. 530 m. 100 lo. 2,682 cars.
B. A. Kimball, Gen. Man.......Concord, N. H.
W. H. Alexander, Pur. Agt.....Concord, N. H.
J. T. Gordon, Supt. M. P. & R. S. Concord, N. H.
G. A. Fergurson, M. M........Lakeport, N. H.
Conn. Riv. R. R. 4-8½ g. 130 m. 55 lo. 688 c. (See Boston & Maine.)
Cooperstown & Charlotte Valley R. R.
4-8½ g. 25 m. 3 lo. 25 cars.
E. M. Harris, G. M.........Cooperstown, N. Y.
D. E. Siver, Pur. Agt.....Cooperstown, N. Y.
A. Gardner, M. M........ Cooperstown, N. Y.
Cornwall R. R., 4-8½ g. 31.1 m. 5 lo. 9 pass. c.
E. C. Freeman, Gen. Man.. ...Lebanon, Pa.
D. S. Hammond, Supt. & Pur. Agt. Lebanon, Pa.
A. J. Reed, M. M................Lebanon, Pa.
Levi Blouch, M. C. B ....Lebanon, Pa.
Cornwall & Lebanon.
4-8½ g. 22 m. 10 lo. 17 p. 540 ft cars.
A. D. Smith, Gen. Supt. & P. A Lebanon, Pa.
R. T. Spotten, M. M.... ......Lebannon, Pa.
Coudersport & Port Allegheny R. R.
4-8½g. 27 m. 3 lo. 80 cars.
B. A. McClure, G. Supt. & P. A. Coudersport, Pa
Cressen & Clearfield County and N. Y. Short Route. (See Pennsylvania Ry.)
Crooked Creek R. R. & Coal Co.
4-8½ g. 24 m. 2 lo. 23 cars.
S. McClure, Gen. Man........ ..Lehigh, Ia.
Cumberland & Maurice River Ry. (See Cent. Ry. of N. J.)
Cumberland & Penn. R. R. 4-8½ g. 55 m. 26 lo. 575 c.
Lewis M. Hamilton, Gen Supt. & P. A., Cumberland, Md.
H. T. Bruck, M. M.............Mt. Savage, Md.
Cumberland Valley R. R. 4-9 g. 166 m. 34 lo. 764 cars.
J. F. Boyd, Supt. & P. A....Chambersburg, Pa.
J. Lawrence, M. M....... ..Chambersburg, Pa.
C. Wicke, M. C. B...... ...Chambersburg, Pa.

D

Danville & Western R. R. 3 g. 83 m. 5 lo. 70 c.
A. B. Andrews, Pres......... Raleigh, N. C.
G. K. Griggs, Supt. & Pur. Agt..Danville, Va.
W. T. Whittaker, M. M...........Danville, Va.
Dayton & Michigan R. R. (See Cin., Ham. & Day.
Delaware & Hudson Canal Co.
4-8½ g. 648 m. 330 lo. 13,387 cars.
H. G. Young, 2d V.-Pres...... Albany, N. Y.
J. White Sprong, Pur. Agt.......Albany, N. Y.
R. C. Blackall, Supt. Mach.......Albany N. Y.
Susq. Div.: C. D. Hammond, A. Supt. Albany, N. Y.
J. R. Skinner, M. C. B.. .....Oneonta, N. Y.
H. C. Smith, M. M.......... Oneonta, N. Y.
Sar. & C. Divs.: C. D. Hammond, Supt. Albany, N. Y.
J. L. Cory, M. M.......... Green Island, N. Y
Chr. Körner, M. C. B.. ...Green Island, N. Y
Pa. Div.: C. R. Manville, Supt.... Scranton, Pa.
C. F. Rettew, M. M..........Carbondale, Pa.
T. Orchard, M. C. B......... Carbondale, Pa.
Del. Lackawanna & Western R. R.
4-8½ g. 969 m. 605 lo. 33,715 cars.
Wm. F. Hallstead, Gen. Man. ...Scranton, Pa.
W. D. Hager, Pur. Agt.......New York, N. Y.
D. Brown, Mast. Mach.......... Scranton, Pa.
Robt. McKenna M. C. B... Scranton, Pa.
Utica Div.: A. C. Salisbury, Supt....Utica, N. Y.
Thos. Thatcher, M. M.............Utica, N. Y.
Morris & Essex Div.; Sussex.
A. Reasoner, Supt.. ....Hoboken, N. J.
W. H. Lewis, M. M ...... Kingsland, N. J.
J. W. Baker, Mast. Car Rep. ....Dover, N. J.
Oswego & Syracuse Div.:
A. H. Schwarz, Supt...... Syracuse, N. Y.
L. Kistler, M. M............Syracuse, N. Y.
Syracuse, Binghamton & New York Div.
A. H. Schwarts, Supt.........Syracuse, N. Y.
Lewis Kistler, M. M.......... Syracuse, N. Y.
Div.: J. B. Marston, Supt........ Buffalo, N. Y.
F. B. Griffith, M. M..............Buffalo, N. Y.

Delaware River R. R. 4-8½ g. 20 m. 3 lo. 11 cars.
W. S. Conner, Gen. Man....Woodbury, N. J.
E. H. Green, Supt. & P. A..Pennsgrove, N. J.
J. B. Gilbert, M. M... .... Pennsgrove, N. J.
Denison & Washita Valley. 4-8½ 14 m. 1 lo. 119 c.
Thos. Fleming, Supt............Denison, Tex.
Denver & Rio Grande Ry.,
3 and 4-8½ g. 1,614.04 m. 293 lo. 7,220 c.
E. T. Jeffery, Pres. & G. M........ Denver, Col.
Henry Schlacks, S. M. P........ Denver, Col.
C. M. Hobbs, Pur. Agt...........Denver, Col.
Delaware, Susquehanna & Schuylkill.
4-9 g. 68 m. 29 lo. 1,513 cars.
D. Coxe, Supt..................Drifton, Pa.
J. B. White, P. A................ Drifton, Pa.
A. J. Beltz, M. M. & M. C. B.....Drifton, Pa.
Des Moines & Kansas City Ry.
3 g. 112 m. 9 lo. 210 cars
John C. Newton, G. M............Des Moines, Ia.
Theo. C. Sherwood, S. & Pur. A. Des Moines, Ia.
E. Dawson, M. M. & C. B..........Osceola, Ia.
Des Moines, Northern & Western R. R.
4-8½ g. 156 m. 14 lo. 197 cars.
F. C. Hubbell, Supt. & P. A...Des Moines, Ia.
B. Reiley, M. M. & M. C. B....Des Moines, Ia.
Det., Bay City & Alpena R. R.
4-8½ g. 150 m. 20 lo. 330 c.
J. D. Hawks, Gen. Man.........Detroit, Mich.
J. D. Hawkes, Pur. Agt ....Detroit, Mich.
H. T. Thomas, M. M. & M. C. B. Tawas City, Mich.
Det., Gr. H. & Mil. Ry. (See Chi. & Gr. Trunk.)
Det., Lansing & No'n and Saginaw Valley & St. Louis Rys. 4-8½ g. 378 m. 47 lo. 2,101 c.
Chas. M Heald, Gen. Man........Detroit, Mich.
R. Wallace, Pur. Agt..............Detroit, Mich.
B. Haskell, Supt. M. P....Grand Rapids, Mich.
Walter. T. Rupert, M. M..........Ionia, Mich.
Dominion Atlantic Ry. 4-8½ g. 234 m. 21 lo. 387 c.
W. R. Campbell, Gen. Man.. Kentville, N S.
W. Yould, M. M. .... Kentville, N. S
W. Grierson, M. C. B........Kentville, N. S.
Duluth, Red Wing & Southern. 4-8½ 2 lo. 41 c.
L. F. Hubbard, G. M.........Red Wing, Minn.
L. N. Stiles, Supt. & P. A...Red Wing, Minn.
H. D. McKay, M. M.........Red Wing, Minn.
J. Lyons, M. C. B.........Red Wing, Minn.
Duluth & Iron Range R. R.
4-8½ g. 141 m. 48 l. 1,767 c.
J. L. Greatsinger, Gen. Man.....Duluth, Minn.
H. S. Bryan, M. M.........Two Harbors, Minn.
Duluth, Miss'be & North'n. 4-8½g. 118.5m. 25lo. 1,280c.
D. M. Philbin, Gen. Man. ...... Duluth, Minn.
S. R. Payne, Pur. Agt...........Duluth, Minn.
A. F. Priest, M. M..............Duluth, Minn.
Duluth, South Shore & Atlantic Ry.
4-8½ g. 598 m. 95 lo. 4,264 c.
W. F. Fitch, Gen. Man......Marquette, Mich.
P. W. Brown, Pur. Agt.......Marquette, Mich.
J. J. Conolly, M. M...........Marquette, Mich.
D. C. Mulvihill, M. C. B......Marquette, Mich.
Duluth & Winnipeg R. R. operated by North Star Construction Co.
4-8½ g. 113 m. 6 lo. 71 cars.
W. F. Fitch, Receiver...... Marquette, Mich.
C. F. Ward, M. M...........La Prairie, Minn.
Dunkirk, Allegheny Valley & Pittsburgh R. R. N. Y. Cen. & H. R. R. R. Lessee)
4-8½ g. 91 m. 12 lo. 111 cars.
Chas. H. Ketcham, Gen. Supt. .Dunkirk, N. Y
Allen Bourn, Pur. Agt.........New York, N. Y.
W. G. Taber, M. M. & C. B.....Dunkirk, N. Y.

E

Eagles Mere Ry. Co. 3 g. 8 m. 3 lo. 23 cars.
Geo. W. Fox, Supt........... Sonestown, Pa.
East Alabama Ry. (See Central of Ga.
East & West R. R. of Ala 4-9 g. 117 m. 12 lo. 140 c.
Chas. P. Ball, Man. & Pur A Cartersville, Ga.
B. F. Lowther, M. M. & M. C. B. Cedartown, Ga.
East Broad Top R. R. 3 g. 44 m. 9 lo. 326 cars.
A. W. Sims, Supt. & P. A..Rockhill Furnace, Pa.
A. W. Greenwood, M. M. Rockhill Furnace, Pa.
Eastern Kentucky R. R. 4-9 g. 36 m. 4 lo. 51 c.
H. W. Bates, Gen. Man. & Pur. A. Greenup, Ky.
A. W. Crawford, M. M.......... Grayson, Ky.
Eastern Ry. Co. of Minnesota: (See Great Northern Ry.)
East Tenn. & Western North Car. R. R
3 g. 34 m. 3 lo. 112 cars.
C. H. Nimson, Gen. Supt.....Cranberry, N. C.
W. Hahn, Pur. Agt...........Cranberry, N. C.
M. W. Lindamood, M. M..Johnson City, Tenn.
East Tennessee, Virginia & Georgia Ry. (See Southern Ry. Co.
Elgin, Joliet & Eastern Ry.
4-8½ g. 176 m. 46 lo. 2,600 cars.
C. H Ackert, Gen. Man............Joliet, Ill.
R. A. Dugan, Pur. Agt...........Chicago, Ill.
John Horrigan, M. C. B ....Joliet, Ill.
E. T. Carlton, M. C. B..............Joliet, Ill.
Elgin & Havelock Ry.
4-8¾ g. 28 m. 2 lo. 12 c.
J. D. Chipman, Man & P. Agt. St. Stephen, N. B.
A. H. Robinson, G. S. & P. A. Petitcodiac, N. B.
W. W. Killam, M. M. & M. C. B. Petitcodiac, N. B.
Elmira, Cortland & Northern R. R.
4-8½ g. 140 m. 23 lo. 180 c.
Albert Allen, Gen. Supt... ....Cortland, N. Y.
M. A. Smith, Pur. Agt...... ....Elmira, N. Y.
Geo Richards, M. M............Cortland, N. Y.
Erie & Huron Ry. 4-8½ g. 74 m. 5 l. 54 c.
J. J. Ross, Gen Man. & P. A.. .Chatham, Ont.
F. Stamelen M. M...............Chatham, Ont.
Erie & Pittsburgh R. R. (See Penna. Co.
Erie & Wyoming Valley R.R. 4-8½g. 68.55m. 37 l l. 186c.
John B. Smith, Pur. Agt..... ...Dunmore, Pa.
Geo. B. Smith, Supt. ....Dunmore, Pa.
S. D. King, M. C. B... ....Dunmore, Pa.
D. E. Barton, M. M ....Dunmore, Pa.
Eureka & Palisade R. R. 3 g. 84 m. 5 lo. 125 cars
D. J. Colton, Gen. Supt & Pur. Agt. Palisade, Nev.
E. W. Harris, M. M...............Palisade, Nev.
Eureka Springs Ry. 4-8½ g. 19 m. 2 lo. 8 cars.
Powell Clayton, Gen. Man. Eureka Springs, Ark.
C. H. Smith, Pur. Agt....Eureka Springs, Ark
J. B. Obenshain, M. M...Eureka Springs, Ark
Evansv. & Terre Haute and Evansville & Indianapolis and Richm'd R's. 4-8½g 315 m, 55 lo. 3,900 c
H. C. Barlow, P. & Gen. Man Evansville, Ind.
A. L. Sanger, P. A ....Evansville, Ind.
John Torrence, S. M. P. & R. S. Evansville, Ind.

F

Fall Brook Ry. 4-8½ g. 257 m. 78 lo. 3,209 c.
Corning, Cowanesque & Antrim; Syracuse Geneva & Corning; Pine Creek; Geneva & Lyons.
G. R. Brown, Gen. Supt..........Corning, N. Y
W. H. Chaphe, Pur. Agt ....Corning, N. Y.
Wm. A. Foster, Supt. Machy... Corning, N. Y
C. J. Butler, M. C. B.. .. ... Corning, N. Y.
Farmville & Powhatan R, R. 3 g. 96 m. 7 lo. 168 c.
Jas. R. Werth, Gen. Man. .... Richmond, Va.
G. M. Wilson, Pur. Agt........Richmond, Va.
C. K. Bowles, M. M ....Chester, Va.
Findlay, Fort Wayne & Western R. R.
4-8½ g. 60 m, 5 lo. 90 cars.
C. G. Patterson, Gen. Man.........Findlay, O.
C. H. Roser, Pur. Agt........... Findlay, O.
A. W Stadler, M. M..............Findlay, O.
Fitchburg R. R., 4-8½ g. 458.43 m. 204 lo. 6,619 c
W. D. Ewing, Gen. Supt..........Boston, Mass
Geo. J. Fisher, Pur. Agt.........Boston, Mass.
J. Medway, Supt. M. P............Boston, Mass.
J. W. Marden, Supt. Car Dept..Boston Mass.
S. W. Simonds, Jr., M. M......Boston, Mass.
Flint & Pere Marq.
3 & 4-8½ g. 777 m. 103 lo. 3,617 cars.
Stanford T. Crapo, Gen. Man.,
J. H. Simpson, Asst. G. M. Saginaw, E. S., Mich.
H. D. Norris, Pur. Agt. .Saginaw, E. S., Mich.
T. J. Hatswell, M. M. & M. C. B. Sagin'w, E. S., Mich.
Florida Midland Ry. 4-8½ g. 45 m. 2 lo. 6 cars.
H. S. Chubb, Rec ....Kissimmee, Fla
J. M. Booth, Supt. & P. A..Kissimmee, Fla.
Florida, Central & Peninsular R. R.
4-9 g. 933 m. 73 lo. 2,083 cars.
D. E. Maxwell, G. M. & Pur. A. Jacksonv'le, Fla
E. Burton, M. M............Fernandina, Fla.
J. J. Bassenger, M. C. B.....Fernandina, Fla.

Florida Southern Ry.
4-9 g. 225 m. 26 lo. 250 cars.
R. B. Cable, G. M..........Jacksonville, Fla.
J. H. Bland, P. A. ....Jacksonville, Fla.
W. H. Young, M. M............Palatka, Fla.
Fonda, Johnst'n & Gloversv. 4-8½ g. 26 m. 9 lo. 40 c.
R. T. McKeever, G. S. & Pur Agt. Gloversville, N. Y.
F. E. Driscole, M. M. & M. C. B. Gloversville, N. Y.
Ft. Worth & Denver City Ry.
4-8½ g. 469 m. 32 l. 1,016 cars.
Morgan Jones, J. D Moore, } Receivers.. Fort Worth, Tex.
E. W Hayes, M. M..........Fort Worth, Tex.
Fort Worth & Rio Grande Ry. 4-8½ g. 147m. 10 l. 115 c.
John Hornby, G S. & P. A. ..Fort Worth, Tex.
H. D. Galbraith, M. M. & M. C. B. Ft. Worth, Tex
Franklin & Megantic R. R. 2 g. 37 m. 2 lo. 50 c.
V B. Mead, Pres & Gen. Man..Boston, Mass
P. H. Stubbs, Pur. Agt ... .Strong, Mass.
W. S. Heath, M. M............... Salem, Me.
Fremont, Elkhorn & Mo. Val. R. R. (See Sioux C. & Pac.)
Fulton County N. G. Ry. 3 g. 61 m. 5 lo. 190 cars
S. H. Mallory, Gen. Man ....Lewiston, Ill.
A. C. Atherton Gen. Supt. & P. Agt...Lewiston.

G

Gal., Harrisburg & San Antonio Ry. (See So. Pac
George's Creek & Cumberland R. R.
4-9 g. 33 m. 9 lo. 1,100 cars.
J. A. Millholland, G. M. & P. A. Cumberland, Md.
Thos. McCann, M. M. & M. C. B. Cumberland, Md.
Georgia R. R 4-9 g. 307 m. 56 lo. 1,155 cars.
Thos. K. Scott, G. M. & P. A.....Augusta, Ga
John S. Cook, M. M...............Augusta, Ga
E. S. Sheetz, M. C. B ....Augusta, Ga.
Georgia, Midland & Gulf R.R. 4-9 g. 100 m. 8 l. 269c.
John F. Flourney, Receiver... Columbus, Ga.
C. W. Chears, Gen. Man.......Columbus, Ga.
J. D. McPhail, M. M. & C. B... Columbus, Ga.
Georgia Southern & Florida R. R.
4-8½ g. 285 m. 29 lo. 967 cars.
J. Lane, Gen Man. & Purch. Agt..Macon, Ga
Geo. D. Harris, M. M. & M. C. B. Macon, Ga
Gettysburg & Harrisburg R.R. (See Phila. & Reading R. R.)
Grafton & Upton R. R.. 4-8¼g. 16¾ m. 3 lo. 7 c.
E. P. Usher, Gen. Man........Grafton, Mass.
F. W Morse, G. Supt. & P A Grafton, Mass.
Grand Rapids & Indiana. 4-9 g. 581 m. 73 lo. 3,229 c.
J. H. P. Hughart, G. M..Grand Rapids, Mich.
W. R. Shelby, Pur. Agt....Grand Rapids, Mich.
J. E. Keegan, M. M......Grand Rapids, Mich.
Grand Tower & Carbondale. (See Chicago & Tex.
Grand Trunk Ry. 4-8½ g. 3,512 m. 795 lo. 23,547 c.
L. J. Seargeant, Gen. Man .... Montreal, Can.
Jno. Taylor, Gen. Storekeeper...Montreal, Can.
Herbert Wallis, Mech. Supt.. ..Montreal, Can.
Wm. McWood, A. M. S. Car Dept. Montreal, Can.
F. L. Wanklyn, A. M. S. Lo. Works. Montreal, Can.
J. D. Barnett, A. M. S. Lo. Wks. Stratford, Ont,
J. W. Harkom, A. M. S. C. Div...Toronto, Ont.
Great Northern Ry. line:
Great Northern Ry. Co.; Montana Central Ry. Co.; Willmar & Sioux Falls Ry. Co; Duluth, Watertown & Pac. Ry. Co.; Pacific Coast lines.
4-8½ g. 4,494 m. 420 lo. 14,328 cars.
Chas. H. Warren, Gen. Man..St. Paul, Minn.
J. W. Blabon, Pur. Agt........St. Paul, Minn.
J. O. Pattee, Supt. M P. ...St. Paul, Minn.
Green Bay, Winona & St. Paul R. R.
4-8½ g 250 m, 22 lo, 464 cars,
S. W. Champion, G. M. & P. A. Green Bay, Wis
A. Fenwick, M. M...........Green Bay, Wis.
Greenfield & Northern, 4-8½ 36 m, 4 lo. 7 cars.
T. A. Miller, Gen. Man.. ....Aurora, Mo.
Green Pond, Walterboro & Branchville Ry.
4-9 g, 14 m, 1 lo, 2 cars.
C. S. Gadsden, Supt.. ... Charleston, S. C.
W. F. Loughman, Pur. Agt. New York, N. Y.
Wm. Rutherford, Supt. M. P. & E. Savannah, Ga.
G. M. D. Riley, M M.......... Savannah, Ga.
Green Ridge R. R. of Maryland.
3 g. 26 m. 2 lo. 20 cars.
F. Mertens, Pres. & P. A Cumberland, Md.
Greenwich & Johnsonville Ry. 4-8½ g. 15m, 2lo, 5c.
J. H. Thompson, G. M.. G. S. & P. A Gr'nwich, N. Y.
Gulf & Chicago R. R. 3 g, 63m. 5 lo. 45 c.
C. L. Harris, Gen Man., G. S. & P. A. Ripley, Miss.
J. P. Dugger, M. M..............Ripley, Miss.
Jno. Reed, M. C. B.... .... Ripley, Miss.
Gulf, Col. & Sante Fe Ry. 4-8½ g, 1,058m, 83 l, 3,396c.
B. F. Yoakum, Gen. Man.... Galveston, Tex.
W. G. Tuller, Pur. Agt............Chicago, Ill.
G. A. Hancock, Supt. of Mach Galveston, Tex.
J. McDonough, Asst. M. M.... Galveston, Tex.
P. W. Farrell, M. C. B.........Galveston, Tex.
So. Div.: John W. Dickinson, Supt. Temple, Tex.
J. W. Kelly, Div. M. M.......Temple, Tex.
Gulf, W'n Texas & Pac. Ry. (See Southern Pacific.)

H

Hannibal & St. Jo. R. R. 4-8½g, 295m, 78lo, 1,540c.
W. C. Brown, Gen. Man ... ..St. Joseph, Mo.
Geo. Hargreaves, Gen. Pur. Agt. Chicago, Ill,
N. J. Paradise, M. M. Lines E. of Brookfield, Hannibal, Mo.
F. A. Chase, M. M. Lines W. of Brookfield, St. Joseph, Mo.
I. N. Wilbur, Div. M. M......Brookfield, Mo.
G. M. Shryock, M. C. B..........Hannibal, Mo.
Housatonic R. R. (See N. Y., N. H. & H R. R.)
Houston & Tex. Cen. Ry. 4-8½g. 510 m, 114 lo. 2,661c.
G. A. Quinlan, V. P & Gen. Man. Houston, Tex
Geo. Howes, Pur. Agt.......New York, N. Y.
Jas. McGee, Act. Supt. M. P & Ma. Houston, Tex.
C. H. Burnes, M. M........ Houston, Tex.
Houston, E & W. Tex. Ry.
4-8½ g, 232 m, 18 lo. 500 cars.
M. G. Howe, V. P. & Gen. Man. Houston, Tex.
A. S. Grant, M. M & M. C. B.... Houston, Tex.
N. S. Meldrum, Pur. Agt........Houston, Tex.
Humeston & Shenandoah R. R.
4-8½ g, 113 m, 18 lo, 80 cars.
E. C. Murphy, Gen. Man., Gen. Supt. & Pur. Agt. Clarinda, Ia.
G. Knapp, M. M. & C. B ..... Shenandoah, Ia.
Huntingdon & Br. Top Mt. R. R.
4-9 g, 63 m. 23 lo. 2,714 c.
Geo. F. Gage, Gen. Man.....Huntingdon, Pa.
Samuel B. Knight, Pur. Agt..Philadelphia, Pa.
C. R. Yohn, M. M.................. Saxton, Pa.
Hutchinson & Southern Ry. 4-8½ g, 82 m. 3 l, 25 c.
Byron Roberts, Rec .... Hutchinson, Kan.

Illinois Central R.R. 4-8½g. 2,888m, 610 lo, 16,632c.
A. W. Sullivan, Gen. Supt ....Chicago, Ill.
C. A. Beck, Pur. Agt..............Chicago, Ill.
Wm. Renshaw, Supt. of Mach....Chicago, Ill
J. J. Casey, Asst. Supt, M. P...Chicago, Ill.
Wm. Apps, M. C. B...............Chicago, Ill.
(1) Northern Lines:
J. C Hartigan, Asst. G. Supt ...Chicago, Ill.
Cherokee Div.: C. K. Dixon, Supt. Cherokee, Ia.
T. W. Place, M. M............Waterloo, Ia.
Chic. Div.: H. Baker, Supt........Centralia, Ill.
J. H. Pollard, M. M........... Centralia, Ill.
Spring Div.:
D. S. Bailey, Supt............ Clinton, Ill.
J. S. Chambers, M. M.............Clinton, Ill.
Ia. Lines.
Thomas W. Place, M. M ....Waterloo, Ia.
Dubuque Div.: F. W. Quimby, Supt Dubuque, Ia.
T. W. Place, M. M...............Waterloo, Ia.
Freeport Div.: F. B. Harriman, Supt. Freeport, Ill.
E. O. Dana M. M... ....Freeport, Ill.
(2) So. Lines: M. Gilleas, Asst. G. S. Memphis, Tenn.
La. Div.: O. M. Dunn, Supt....New Orleans, La.
T. C. Losey, M. M. .....McComb City, Miss.
Miss. Div.: N. D. Wiggins, Supt. Jackson, Tenn.
G. Dickie, M. M..........Water Valley, Miss
Memphis Div.: J. B. Kemp, Supt. Memphis, Tenn.
J. J. O'Rourke, M. M ...... Memphis, Tenn.
Indiana & Illinois Southern R.R. 4-9g, 91m. 6 l, 109c.
P. H. Blue, Gen. Man. & P. Agt. Sullivan, Ind.
M. E. Hotchkiss, M. M ....Palestine, Ill
Indiana, Illinois & Iowa R.R.
4-8½ g, 209.02 m, 24 l. 178 c.
T. B. Shonts, Gen. Man. & Pur. Agt. Chicago, Ill.
L. H. Miller, M. M. & M. C. B..Kankakee, Ill.
Indianapolis & St. Louis R. R. (See C., C. C. & St. L.

Indianapolis & Vincennes R R. (See Penn. Co.)
Indiana, Decatur & Western Ry.
4-8½ g, 153 m, 18 lo, 762 c.
R. B. F. Pierce, Gen. Man..Indianapolis, Ind.
C. B. McVay, Pur. Agt......Indianapolis, Ind.
J. McKenna, M. M..........Indianapolis, Ind.
Intercolonial Ry. of Canada.
4-8½ g, 1,142 m. 206 lo, 6,844 c.
David Pottinger, Gen. Man....Moncton, N. B
T. V. Cooke, Pur. Agt ....Moncton, N. B.
F. R. F. Brown, Mech. Supt..Moncton, N. B.
D. White, Gen. Car Foreman..Moncton, N. B.
International & Great Northern Ry.
4-8½ g, 825 m, 109 lo. 1,788 cars.
T. M. Campbell, Gen. Man. & Pur. Agt., Palestine, Tex.
F. Hufsmith, M. M.......... Palestine, Tex.
W. P. Siddons, M. C. B.. .....Palestine, Tex.
Interoceanic Ry. 3 g, 519 m, 64 lo 964 cars.
E. W. Jackson, Gen. Man ...Texcoco, Mex.
C. A. Crail, Pur Agt.......... Texcoco, Mex.
E V. Sedgwick, Supt. M. P. City of Mexico, Mex.
E. M. Ruth, M. C. B........ Texcoco, Mex.
Iowa Central Ry. 4-8½ g, 498 m, 66 lo, 2,255 cars.
Col. L. M. Martin, G. M....Marshalltown, Ia.
S. M. Rogers, Pur. Agt....Marshalltown, Ia.
J. F. Graham, M. M.........Marshalltown, Ia.
E. E. Carver, M. C. B......Marshalltown, Ia.
Iron Ry. 4-8½ g, 20 m, 4 lo, 214 cars.
C. C. Clarke, Gen. Man............Ironton, O.
B. S. J. Garvey, Pur. Agt..........Ironton, O.
G. A. Meyers, M. M ....Ironton, O.
B. Martin, M. C. B ....Ironton, O.
Irondale, Bancroft & Otawa Ry.
4-8½ g, 17 m, 2 lo, 15 cars.
Chas. J. Pusey, Gen. Man......Irondale, Ont.
Ironton R. R. 4-8½ g. 12 m. 2 lo. 9 c.
W. Andrews, Gen. Supt....... Allentown, Pa.
W. M. Kuhns, Pur. Agt.........Allentown, Pa.
S. R. Thomas, M. M.......Hokendauqua, Pa.

J

Jacksonville, St. Augustine & Indian River Ry., operating Atlantic & Western Ry. of Florida.
4-9 g. 339 m. 27 lo. 150 cars.
R. T. Goff, Supt ....St. Augustine, Fla.
J. D. Wright, Pur. Agt...... New York, N. Y.
E. T. Silvius, M. M......... St. Augustine, Fla.
Jacksonville, Tampa & Key West Ry.
4-9 g. 200 m. 26 lo. 510 cars.
Joseph H. Durkee, Receiver. Jacksonville, Fla.
J. H. Bland, Pur. Agt......Jacksonville, Fla.
F. E. Tubbs, M. M ....Palatka, Fla.
Jeffersonv., Mad. & Ind. R. R. (P., C., C. & St. L. Ry.

K

Kanawha & Michigan Ry. ..4-9 g. 168 m. 15 l. 600 c. (See Ohio Central lines.)
Kansas City, St. Joseph & Council Bluffs.
4-8½ g. 308 m. 44 lo. 1,042 c.
W. C. Brown, Gen. Man..... St. Joseph, Mo.
Geo. Hargreaves, Pur. Agt..... Chicago, Ill.
F. A Chase, M. M.............St. Joseph, Mo.
T. Aylesbury, M. C. B..........St. Joseph, Mo.
Kansas City & Independence Rapid Transit Ry
4-8½ g. 23 m. 8 lo. 38 cars.
C. F. Holmes, Gen. Man......Kansas City, Mo.
W. A. Saterlee, Pur. Agt....Kansas City, Mo.
C. Wiseman, M. M. & M. C. B. Kansas City, Mo.
Kansas City, Osceola & Southern Ry.
4-8½ g. 140 m. 10 lo. 281 c.
B. S. Josselyn, G. M. Supt. & P. A. Clinton, Mo
Leslie McLachlin, M. M. & M. C. B. Clinton, Mo
Kansas City, Fort Scott & Memphis, Kansas City, Clinton & Springfield and Current River Rys.
4-8½ g. 915 m. 186 l. 7,625 c.
Geo H. Nettleton, Gen. Man Kansas City, Mo.
H. P Jacques, Pur. Agt....Kansas City, Mo.
S. M. P. & M. Kansas City, Mo.
W. A. Nettleton, A. S. M. P. & M..Ks. City, Mo.
A. N Monteer, M. C. B........Springfield, Mo.
Jas. Bissett, M. M ....Springfield, Mo.
Kansas City Memphis & Birmingham R. R.
4-8½ g. 276 m. 41 lo. 1,798 c.
Geo. H. Nettleton, Gen. Man. .Kan. City, Mo.
H. P. Jacques, Pur. Agt....Kansas City, Mo.
J. S. McCrum, Supt. M. P. & M. Kansas City, Mo.
R. H. Briggs, M. M......... ...Memphis, Tenn.
Kansas City, Pittsburgh & Gulf R. R.
4 ft. 8½ in. g. 235 m. 11 l. 480 cars.
R. Gentry, Gen. Man. & P. A. Kansas City, Mo.
Frank Adams, Pur. Agt....Kansas City, Mo.
W. H. Traver, M. M..........Kansas City, Mo.
Kansas City, Watkins & Gulf Ry.
4-8½ g. 100 m. 9 lo. 239 cars.
F. S. Hammond, Gen, Man..Lake Charles, La.
J. B. Watkins, Pur. Agt..Lake Charles, La.
J. C. Ramsey, M. M. & M. C. B. Lake Charles, La.
Kent Northern Ry. 4-8½ g 45 m. 4 lo. 31 cars.
W. Brown, Gen. Man...... Richibucto, N. B.
T. Murray, Supt. & M. C. B. Richibucto, N. B.
E. Animaux, M. M.......... ....Richibucto, N. B.
Kentucky & Indiana Bridge Co.
4-8½ g. 16 m. 5 lo. 17 cars.
G. MacLeod, G. M..............Louisville, Ky.
J. Newhouse, M. M ....Louisville, Ky.
W. F. Davis, M. C. B...........Louisville, Ky.
Kentucky Midland Ry. 4-8½ g. 40 m 4 l. 35 c.
Geo. B. Harper, Rec., S. & P. A. Frankfort, Ky.
M. Horton, M. M ....Frankfort, Ky.
Kentucky & South Atlantic Ry. (See Chesapeake & Ohio Ry. Co.)
Kentucky Central Ry. (Operated by L. & N. R. R.)
Keokuk & Western R. R. 4-8½ g. 148 m. 14 l. 955 c.
A. C. Goodrich, G. M. & Pur. Agt Keokuk, Ia.
W. Augustus, M. M. & M. C. B. Centerville, Ia.
Kickapoo Valley & Northern Ry. Co.
4-8½ g. 34 m. 2 lo. 14 cars.
W. H. Thomson, G. M. & P. A. Wauzeka, Wis.
Kings Co. Elevated Ry. 4-8½ g. 9 m. 44 lo. 145 c.
W. T. Goundie, Gen. Man., Supt. & Pur. Ag., Brooklyn, N. Y.
W. F. Thompson, M. M........Brooklyn, N. Y
W. S. Sutton, M. C. B....... Brooklyn, N. Y.
Kingston & Pembroke Ry. 4-8½ g. 123 m. 13 lo. 560 c.
Jos Baldwin, Receiver...... Kingston, Ont.
B. W. Folger, Gen. Man. & P. A. Kingston, Ont.
F. Clark, M. M...................Kingston, Ont.
D. Nesbith, M. C. B............Kingston, Ont.
Knoxville & Augusta R.R, 4-8½ g. 16m 2 lo. 30 cars.
W. P. Hood, Gen Supt. & P. A Knoxville, Tenn.
John L. Bradford, M. M Knoxville, Tenn.
W. C. Bruce, M. C. B.........Knoxville, Tenn.
Knoxville, Cumberland Gap & Louisville,
4-9 g. 75 m, 12 lo. 450 cars.
L. F. Wynne, Supt.........Knoxville, Tenn.
H. G. Fraser, Pur. Agt....Knoxville, Tenn.
B. J. Sitton, M. M. & M. C. B..Knoxville, Tenn.

L

Lake Champlain & Moriah Ry.
4-7½ g. 16 m. 9 lo. 315 cars.
A. E. Tower, G. M. & P. A. Poughkeepsie, N. Y
C. P. Morrison, M. M.. ...Port Henry, N. Y.
R. C. Smith, M. C. B........Port Henry, N. Y.
Lake Erie, Alliance & So'n Ry. 4-8½g. 36m. 1 l. 74c
E. E. Scranton, Rec., M. & P. Agt.... Alliance, O.
C. P. Finch, M. C. Repairer..... Alliance, O.
Lake Erie & Detroit River Rd.
4-8½ g. 108 m. 7 lo. 218 c.
E. C. Walker, Man. Dir....Walkerville, Ont.
Alex. Leslie, Pur. Agt ......Walkerville, Ont.
S. Austin, Mech. Supt......Walkerville, Ont.
Lake Erie & West'n R. R. and Ft. Wayne, Cin. & Louisville Ry. 4-8½ g. 718 m. 120 lo. 5,719 c.
Gen. Man. Indianapolis, Ind.
T. H. Perry, Pur. Agt......Indianapolis, Ind.
P. Reilly, Supt Equipment ...... Lima, O.
Lake Shore & Michigan So'n Ry.
4-8½ g. 1,448 m. 591 lo. 21,582 cars.
D. W. Caldwell, Pres. & G. Man. Cleveland, O.
Chas. B. Couch, Pur. Agt.........Cleveland, O.
G. W. Stevens, Supt. M. P. .... Cleveland, O.
A. M. Waitt, Gen. M. C. B......Cleveland, O.
A. A Bradeen, M. M............ Cleveland, O.
East'n Div.: T. W. Niles, Supt... Buffalo, N. Y.
E. E. Elden, M. M.... ....Buffalo, N. Y.
A. C Robson, M. C. B.... ...Buffalo, N. Y.
Geo. N. Dow, M. C. B ....Cleveland, O.
Frank. Div.: A. H. Smith, Supt. Youngstown, O.
Toledo Div.: J. K. Russell, Supt .Cleveland, O.
J. O. Bradeen, M. M........... Norwalk, O.

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EFFICIENT. · DURABLE. · LOW PRICED.

These pumps are capable of delivering air at a higher pressure than the steam pressure used to run them with, and are designed for efficient service in shops or other places where the steam pressure is low, and a moderate quantity of air is needed. They require practically no floor room, can be set up anywhere against a wall, and are particularly adapted for Pneumatic Hoists, Pneumatic Tools, Lard Refineries, Breweries, Automatic Dry Pipe Sprinkler systems, and many other purposes in Manufacturing Plants, Railway Shops, Etc. Prices and capacities as follows:

No. 3, Price $125.

With 60 lbs. steam pressure this pump will deliver 80 lbs. air pressure at a maximum rate of 4 cu. ft. per minute, or such an air pressure can be maintained against an opening 3-16 in. diameter. With steam at 70 lbs. it will deliver air at 100 lbs. pressure.

No. 4, Price $100.

This pump is smaller than the No 3, and has one-half to two-thirds the latter's capacity. With steam at 50 lbs. it will deliver 65 lbs. air pressure at a maximum rate of 1.8 cu. ft. per minute; or, if the steam is raised to 60 lbs., at the rate of 3 cu. ft. per minute.

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J. R. Reniff, M. C. B.......... Norwalk, O.
Mich. Divs.: L. E. Johnson, Supt.....Toledo, O.
F. O. Bray, M. C. B...........Adrian, Mich.
Det. Brs.: S S. Hand, Supt.......Detroit, Mich.
Lansing, Ypsilanti & Ft. Wayne Branches:
H. A. Worcester, Supt.....Hillsdale, Mich
Western Div.: A. B. Newell, Supt...Chicago, Il.
W. L. Gilmore, M. M..........Elkhart, Ind.
T. Fildes, M. C. B..........Englewood, Ill.
Lakeside & Marblehead Ry. 4-8½g 10 m. 2 lo.11 c.
C. E. Gowen, G. M. & P. A.....Cleveland, O.
W. M. Harsh, G. S...........Cleveland, O.
Lancaster, Oxford & Southern R.R. 3g,20m.2 l.23c,
A. M. Nevin, Gen. Man. & P. A...Oxford, Pa.
Lebanon Springs R. R. 4-8½ g. 58 m. 4 lo. 18 cars.
Wm. V. Reynolds, Rec........Bennington, Vt.
E.D. Bennett Supt.&Pur. Agt. Bennington, Vt.
S. Hawley, Act. M.M.& M.C.B. Chatham, N.Y.
Lehigh & Hudson River Ry. 4-8½g.90m.23lo.755c.
Grinnell Burt, Gen. Man......Warwick, N. Y.
E. M. Reynolds, Pur. Agt....Warwick, N. Y.
S. Mills, M. M..................Warwick, N. Y.
Lehigh & Lackawanna R.R. (See Cent.R.R.of N.J.)
Lehigh Valley R. R 4-8½g.2,441m.662lo.54,400c.
R. H. Wilbur, Gen. Supt. So. Bethlehem, Pa.
Samuel Higgins, Supt.M.P. So. Bethlehem, Pa.
W. C. Alderson, Pur. Agt..Philadelphia, Pa.
J. I. Kinsey, M. M .... So. Easton, Pa.
David Clark, M.M.............Hazleton, Pa.
F. Roth, M. M...........Wilkes-Barre, Pa.
J. N. Weaver, M. M..............Sayre, Pa.
John Campbell, M. M........Buffalo, N. Y.
John S. Lentz, Supt. Car Dept. Packerton, Pa.
Lexington & Eastern Ry. Co.
4-9 g. 95 m. 7 lo. 373 cars.
J. D. Livingston, G.M.&P.A. Clay City, Ky.
Geo. F. Foster, M. M.&M.C.B..Clay City, Ky.
Ligonier Valley R. R. 4-9 g. 11 m. 3 l. 19 cars.
Thos. A. Mellon, Gen. Man....Pittsburg, Pa.
Geo. Senft. S.P.A., M.M.& M.C.B..Latrobe, Pa
Little Miami Ry. (See P., C. & S. L.
Little Rock & Fort Smith. (See Mo. Pac.
Lit. Rock & Memphis R.R. 4-8¾g. 135m.16lo.303c
R. Fink, G. M. & P. A.....Little Rock, Ark.
C. Robkin, M. M..............Argenta, Ark
A. Waldo, M. C. B...............Argenta, Ark
Little Saw Mill Run R. R 4-8½ g. 3 m. 4 lo. 178c.
R. W. Jones, Gen. Man........Pittsburgh, Pa.
C. Schoeneman, Pur. Agt......Pittsburgh, Pa.
Alf. Easton, M. M........... Banksville, Pa.
Jas. Easton, M. C. B...... Banksville, Pa.
Litchfield, Carrollton & Western Ry. Co.
4-8½ g. 58 m. 2 l. 36 cars.
Henry S. Carrall, Gen. Man... Carlinville, Ill
F. C. Dodds, Pur. Agt........Springfield, Ill.
Geo. W. Lipscomb, M. M......Carrollton, Ill.
Long Island R. R. 4-8½ g. 360 m. 159 lo. 1,878 cars.
E. R. Reynolds, Gen. Man. Long Island City, N.Y.
G. L. Hubbell, Pur. Agt. Long Island City, N.Y.
S F. Prince, Jr., S.M.P.& E. Morris Park, N.Y
Los Angeles Terminal Ry.
4-8½ g. 51 m. 8 lo. 171 cars.
T. B. Burnett, P. A. & G.M. Los Angeles, Cal.
T. R. Shanks, M.M.&M.C.B. Los Angeles, Cal.
Louisville & Nashville R. R.
4-9 g. 3,158 m. 548 lo. 19,951 cars.
J. G. Metcalfe, Gen. Man ....Louisville, Ky.
P. P. Huston, Pur. Agt......... Louisville, Ky.
P. Leeds, Supt. Mach............Louisville, Ky.
A. Beckert, Gen. M. M....New Decatur, Ala.
Kent. Cen. Div.: L. Hood, Supt...Cincinnati, O.
Wm. Adair, M M...............Covington, Ky.
Louisv., Cin. & Lex. Div.:
C. A. Davies, Supt.......... E. Louisville, Ky.
Wm. Adair, M. M.............E Louisville, Ky.
Lou. Div.: W. P. Pike, Supt ....Louisville, Ky.
J. G. Clifford, M. M............Louisville, Ky.
Nash. Div.: J. Geddes, Supt... Nashville, Tenn.
R. Moran, M. M...........Bowling Green, Ky.
Mob. & M.: Div. Pens. & Sel. R. Rs.:
J. J. McKinney, Supt.....Montgomery, Ala.
H. Minto, M. M......................Mobile, Ala.
Pensacola Div.:
E. O. Saltmarsh, Supt......... Pensacola, Fla.
C. F. Giles, M. M...............Pensacola, Fla
Memp. Line Div.: L.S. Robertson, S. Memphis, Tenn.
J. V. Slusser, M. M............Memphis, Tenn.
St. L. & Hend. Div:
B. F. Dickson, Supt............Evansville, Ind.
Thos. Walsh, M. M..............Howell, Ind.
Louisville, Evansville & St. L. Consolidated R. R.
4-8½ g. 368 m. 59 lo. 2,460 cars.
E. O. Hopkins, Gen. Man.....Evansville, Ind.
H. W. Matters, Pur. Agt.........Princeton. Ind.
J. K. Lape, Supt. M.P. & M . Princeton, Ind.
Louisville, New Albany & Corydon.
4-8½ g. 11 m. 2 l. 3 cars.
M. J. O'Connor, Gen Man...... Corydon, Ind.
G. W. Briffett, S.P.A.&M.M .Corydon, Ind.
Louisville, New Albany & Chicago Ry.
4-8½ g. 536 m. 95 lo. 6,077 cars.
W. H. McDoel, Gen. Man......... Chicago, Ill.
H. Craig. Pur. Agt..................Chicago, Ill.
H. Delaney, M. M............New Albany, Ind.
Chas. Collier, M. C. B........New Albany, Ind.
Louisville, New Orleans & Tex. Ry. (See Ill. Central)
Louisville, St. Louis & Texas Ry.
4-9 g. 186 m. 15 lo. 768 cars.
Attilla Cox, Rec................ Louisville, Ky.
A. M. McCracken, Gen. Sept... Louisville, Ky.
C. P. Bush, Pur. Agt.............Louisville, Ky.
F. J. Ferry, M. M.............Cloverport, Ky.

M

Macon & Northern. 4-8½ g. 107 m. 6 lo. 460 cars.
E. T. Horne, Gen. Man.& P. A.. Macon, Ga
A. H. Porter, Supt ....Macon, Ga.
W. A. Carey, M. M. & M. C.B....Macon, Ga.
Macon, Dublin & Savannah.
4-8½ 54 m. 2 lo. 47 cars.
J. T. Wright, Gen. Man..........Macon, Ga.
P. Hough, Pur. Agt...............Macon, Ga.
Maine Central R. R. 4-8½ g. 821 m. 156 lo. 3,549 c.
Payson Tucker, V.-Pres.& G.M..Portland. Me.
A. S. Bosworth, Supply Agt....Portland, Me
Amos Pilsbury, Supt. M. P... Waterville, Me.
C. H. Kenison, M. C. B........Waterville, Me.
Manhattan Ry. 4-8½ g 36 m. 381 lo. 1,116 c.
Frank K. Hain, 2d V.-Pres. G. M. & P. A.,
New York, N. Y.
T. W. Peeples, M. M..........New York, N.Y.
H. A. Webster, M. C. B.......New York, N.Y.
Manistee & Luther Ry. 3 g. 60 m. 6 lo. 240 cars.
R. G. Peters, Gen. Man........Eastlake, Mich.
H. W. Carey, Pur. Agt.......Eastlake, Mich.
T. J. Peach, M. M. & M. C. B. Eastlake, Mich,
Manistee & North East'n Ry. 4-8½g.108m. 9lo.29 c.
Edward Buckley, Gen. Man...Manistee, Mich.
J.M. Peterson, Pur. Agt......Manistee, Mich.
Wm. H. Nuttall, S.M.P.&R.S..Manistee, Mich.
E. N. Wiest, M. C. B...........Manistee, Mich.
Maricopa & Phœnix R. R. 4-8½ g. 35 m. 3 l. 20 c.
C. S. Masten, Gen. Man.......Phœnix, Ariz.
F. I. Kendall, Pur. Agt....San Francisco, Cal.
M. S. Webb, M. M. & M. C. B..Phœnix, Ariz.
Marietta & North Georgia R. R
4-9 g. and 3 ft. g. 231 m. 231 m. 18 lo. 250 c.
J. B. Glover. Receiver............Marietta, Ga.
J. B. Glover, Jr., S. M. P..........Marietta, Ga.
Mason & Oceana Ry. 3 g. 27 m. 7 lo. 225 cars.
M. McDermott, Gen. Supt ...Ludington, Mich.
O. Wrege, M. M ....Ludington, Mich
J. Johnson, M. C. B........Ludington, Mich,
Mason City & Ft Dodge R.R. 4-8½g. 92 m. 6 l. 151c.
C. C. Burdick, G. M. S. & P. A. Fort Dodge, Ia.
R. H. Emerson, M. M. & C. B. Fort Dodge, Ia.
Massillon & Cleve. Ry. (See Penna Co.)
Meadville & Linesville Ry (See Pitts., Shen. & Erie Ry.)
Memphis & Charleston R. R. (See E.Ten., Va.& Ga.)
Mexican Ry. 4-8½ g. 321 m. 55 lo. 720 cars
Geo. Foote, Gen. Supt ....Mexico, Mex
H. G. Evans, Loco. Supt.........Mexico, Mex.
Mexican Central Ry. 4-8½g. 1,876m. 149lo. 2,890c.
E. W. Baker, Pur. Agt ....Boston, Mass,
H. R. Nickerson, Gen. Man....City of Mexico.
F. W. Johnstone. Supt.M.P.&M. City of Mexico
J. H. O'Brien, M. C. B.........City of Mexico.
(P. O. Address of all Officers in Mexico is El Paso, Texas.)

Mexican International R. R.
4-8½ g. 575 m. 46 lo. 1,486 cars.
L. M. Johnson, Gen. Man.,
Ciudad Porfirio Diaz, Mex.
W. Hollis, Pur. Agt. Ciudad Porfirio Diaz, Mex.
W. Jennings, M. M. & M. C. B.
Mexican National R. R. 3 g. 1,218 m. 122 lo. 2,538 c.
E. N. Brown, Gen. Man.......City of Mexico.
A. Anderson, Jr., Pur. Agt..New York, N. Y.
Thos. Milan, S. M. P. & Mach...Laredo, Tex.
Northern Division:
J. N. Galbraith, Supt.............Laredo, Tex.
J. Farrell, M. M...................Laredo, Tex.
San Luis Div.:
B. Magnum, Supt........San Luis Potosi, Mex.
M. J. Schneider, M. M...San Luis Potosi, Mex.
Southern Div.:
V. R. Dwinell, Supt......City of Mexico, Mex.
Robert Dewar, M. M.........Santiago, Mex.
Michoacan & Pacific Ry.
3 g. 60 m. 5 lo. 100 cars.
A. Atwood, Gen. Man.......Maravatio, Mex.
L. R. Gordon, Supt. & P. A..Maravatio, Mex,
J. O. Nicholas, M.M.&M.C.B. Maravatio, Mex.
Michigan Cen. R. R. 4-8½g. 1,683m. 461 lo. 14,121 c
H. B. Ledyard, Pres.&Gen. Man. Detroit, Mich.
Robt. Miller, Gen. Supt........ Detroit, Mich.
J. R. Dutton, Pur. Agt.........Detroit, Mich.
C. E. Smart, Gen. M. M.......Jackson, Mich.
E. D. Bronner, M. C. B..........Detroit, Mich.
(1) Lines West of Detroit River:
East., Toledo & Bay City Divs.:
D. S. Sutherland, Supt..........Detroit, Mich.
P. Miller, M. M....................Detroit, Mich.
Sag. & Mack. Div.:
W. J. Martin, Supt...........Bay City, Mich.
M. Ryan, M. M................Bay City, Mich.
Mid. Air Line: Gr. Rap. and So. Hav. Divs.:
O. F. Jordan, Supt..............Jackson, Mich.
West & Joliet Divs.:
J. H. Snyder, Supt ....Chicago, Ill.
J. G. Riley, M. M................Chicago, Ill.
2) Lines East of Detroit River:
Canada & Mich. Mid. Divs.:
J. B. Morford, Supt.......... St. Thomas, Ont.
M. L. Flynn, M. M...........St. Thomas, Ont.
R. Potts, Gen. F. C. Dept....St. Thomas, Ont.
Millen & Southern. 4-8½ g. 32 m. 4 lo. 13 cars
J. F. Gray, Supt. & P. A..........Millen, Ga.
F. W. Reavey, M. M................Millen, Ga.
Mineral Range and Hancock & Calumet Rys.
3 g. 42 m. 16 l. 466 cars.
W. F. Fitch, Gen. Man....Marquette, Mich.
J. C. Shields, Supt. & M. M. Hancock, Mich.
P. W. Brown, P. A..........Marquette, Mich.
C. Angee, M. C. B............Hancock, Mich.
Midland No. Car Ry. (See Atl. Coast Line.)
Milwaukee & Northern R.R.
(See C., M. & St. P. Ry. Co.)
Milwaukee, Lake Shore & Western Ry. Co.
(See Chicago & Northwestern.)
Minneapolis & St. Louis Ry.
4-8½g. 583 m. 69 lo. 2,500 cars.
A. L. Mohler, Gen. Man...Minneapolis, Minn.
T. E. Clarke, Gen. Supt....Minneapolis, Minn.
S. M. Lohren, Pur. Agt....Minneapolis, Minn.
J. Tonge, M. C.B.& M.M...Minneapolis, Minn.
Minneapolis, St. Paul & Sault Ste. Marie.
4-8½ g. 1 160 m. 103 lo. 6,035 cars.
F. D. Underwood, Gen. Man. Minneapolis, Minn.
W. T. Watkins, Pur Agt..Minneapolis, Minn.
E. A. Williams Mech. Supt. Minneapolis, Minn.
Mississippi River & Bonne Terre Ry.
4-8½ g. 48 m. 9 lo. 110 cars.
J. Burns, Supt................Bonne Terre, Mo.
G. Setz, P. A...................Bonne Terre, Mo.
J.F. Kehrmon, M.M.&M.C.B. Bonne Terre, Mo.
Mississippi R. & No. West. Ry. 4-8½g. 12m. 2 lo. 32c.
A. Kimball, G.M.& Supt. Arkansas City, Ark.
P. Kimball, P.A.&M.M. Arkansas City, Ark.
E. Kroger, M. M.........Arkansas City, Ark.
Missouri, Kansas & Texas Ry.
4-8½ g. 2,073.1 m. 246 lo. 110 pass. c., 7,529 c.
A. A. Allen, Gen. Supt...........Parsons, Kan.
C. N. Stevens, Pur. Agt ......St. Louis, Mo.
Wm. O. Herin, Supt. M. P.....Parsons, Kan.
C. T. McElvany, M. M..........Denison. Tex.
J. Doyle, M.C.B.................Denison, Tex.
Missouri Pacific Ry. (Leased and operated and independent lines.)
4-8½ g. 3,218.39m. 35 lo. 12,695ft. cars. 364pass.c
Wm. B. Doddridge, Gen. Man..St. Louis, Mo.
F. Rearden, Supt. Loco. & Car Depts.,
St. Louis, Mo.
A. Gould, Pur. Agt...............St. Louis, Mo.
L. Bartlett, Div. M. M..........St. Louis, Mo.
S P Weller, Div. M. M......... Sedalia, Mo.
W. T. New, Asst. M. M....Kansas City, Kan.
W. J. Hill, Div. M. M......Osawatomie, Kan.
J. T. Jones, Asst. M. M......Ft. Scott, Kan
Central Branch Union Pac. Ry.
4-8½ g. 388.19 m. 35 lo. 564 ft. cars, 23 pass. cars.
H. G. Clark, Gen. Supt........St. Louis, Mo.
C. W. Weller, Div. M. M.... Atchison, Kan.
St. Louis, Iron Mountain & Southern Ry.
4-8½ g. 1,773.47m. 255 lo. 9,486 ft. cars, 131 pass.c.
E. A. Peck, Gen. Supt........ St. Louis, Mo.
W. H. Harris, M. M............De Soto, Mo.
Mord. Roberts, M. M......Baring Cross. Ark.
Mobile & Ohio R. R. 4-8½ g. 687 m. 107 lo. 3,687 c.
Jas. C. Clarke, Pres.&Gen. Man..Mobile, Ala.
R. H. Duesberry, Pur. Agt......Mobile, Ala.
M. T. Carson, Supt. Machy..Jackson, Tenn.
J. D. Gurganus, M. C. B.......Whistler, Ala.
St. L. Div.: H.W Clarke, Supt. Ea. St. Louis, Ill.
A. B. Minton, M. M.......Murphysboro, Ill.
G. Manuel, M. M.............Jackson, Tenn.
D. O. Smith, M. M..............Whistler, Ala.
Mohawk & Malon Ry. (See N.Y. C. & H. R. R. R.)
Monongahela River R. R. 4-8½ g. 33 m. 7 l. 1,135 c.
H. G. Bowles, G.S.&P.A.....Monongah, W.Va.
Wm. Stanhagen, M.M.&M.C.B. Watson, W.Va.
Monson R. R. 2 g. 8 m. 2 lo. 15c.
J. F. Kimball, Gen. Man ....Wilton. N. H.
W. L. Estabrooke, Pur. Agt.....Monson, Me.
H. E. Morrill, M.M &M.C. B....Monson. Me.
Montana Central Ry. 4-8½ g. 253 m. 21 lo. 835 c.
(See Great Northern,)
Montana Union Ry. Co 4-8½ g. 72 m. 29 l. 369 c.
Wm. H. Burns, Gen. Man.& P. A Butte Mont.
G Lindoff, M. M. & M. C.B. Anaconda, Mont.
Monterey & Mex. Gulf. Ry. 4-8½ g. 390m. 127 lo. 595c.
J. A. Robertson, Gen. Man....Monterey, Mex.
D. W. Lindsay, Pur. Agt. ....Monterey, Mex.
F. C. Barron, M.M. & M.C.B. Monterey, Mex.
Montour R. R. 4-8½ g. 12 m. 2 lo. 260 cars
U. A. Andrews, Gen. Man.&P A. Pittsburgh, Pa.
V. M. Delamater, Supt..........Imperial, Pa.
Jas. Nelson, M. M & M. C. B....Imperial, Pa.
Montpelier & Wells Riv. R.R. and Barre Branch R.R.
4-8½ g. 44 m. 6 lo. 115 c.
W. A. Stowell, Gen. Man.......Montpelier, Vt.
F. W. Morse, Pur. Agt ....Montpelier, Vt.
G. Jacobson, M. M............Montpelier, Vt.
C. F. Robinson, M. C. B........Montpelier, Vt.
Morgan's Louis. & Tex. R.R. (See Southern Pacific.)
Mount Washington R. R. 4-7½ g. 3 m. 6 lo. 7 cars.
Gen. Man.& Supt. Franklin, N.H.
G. W. Starer, Pur. Agt........Boston, Mass.
John Horne, M. M. & M.C. B. Lakeport, N. H.

N

Narragansett Pier R. R. 4-8½ g. 8½ m. 2 lo. 16 c.
G. T. Lanphear, Supt.& Pur. Agt. Peacedale, R.I.
E. Gardner, M. M............Peace Dale, R. I.
Nashville, Chattanooga & St. Louis Ry.
4-9 g. 884.09 m. 161 lo. 4,630 cars.
J. W. Thomas G. Man.........Nashville, Tenn.
J. W. Thomas, Jr., Pur. Agt., Nashville, Tenn.
James Cullen, M. M. & C.B...Nashville, Tenn.
Natchitoches & Red River Valley R. R. Co.
4-8½ g. 16 m. 2 lo. 11 cars.
L. Caspari, G. Man. & P. A. Natchitoches, La
Nevada, California and Oregon Ry. 3g. 80 m. 4 lo 50 c.
E. Gest, Gen. Man.................Reno, Nev.
Nevada Central R. R. 3 g. 93 m. 3 lo. 41 c.
W. J. Phillips, Gen. Man. & P.A..Austin, Nev.
J. C. Slater, M. M. & M. C. B.
Battle Mountain, Nev.

Nevada County N. G. R. R. 3 g. 23 m. 3 lo. 60 cars
John F. Kidder, G. Man.&P.A. Grass Valley, Cal.
Jas. McCormick, M. M. & C. B. Grass Valley, Cal.
New Brunswick & Prince Edward Island Ry.
4-8½ g. 36 m. 3 lo. 37 cars.
Josiah Wood, Gen. Man.......Sackville, N. B.
F. C. Harris, Supt., P.A & M.M. Sackville. N. B.
Newburg, Dutchess & Conn. R. R.
4-8½ g. 58 miles, 7 l. 132 c.
John S. Schultze, Gen. Man. & P. A.
Matteawan, N. Y.
Gilman D. Holmes, M. M. & C. B.,
Dutchess Junction, N.Y.
New Jersey & New York Ry.
4-8½ g. 45 m. 10 lo. 115 c.
J. D. Hasbrouck, Gen. Man. & P.A..
Jersey City, N. J.
J. S. Drake, Supt. & M. M......Hillsdale, N. J.
L. B. Van Wagner, M. C. B .....Hillsdale. N. J.
New London Northern R. R. (See Central Ver.)
New Mexico & Arizona. (See A.T.&Santa Fe R.R.)
New Orleans, Fort Jackson & Grand Isle R. R.
4-8½ g. 61 m. 5 lo. 59 cars.
J. S. Landry, Supt. & P. A........Algiers, La.
C. S. Burgis, M. M. & M. C. B.....Algiers, La.
New Orleans & Northwestern Ry.
4-8½ g 102 m. 7 lo. 70 cars.
L. K. Hyde, Rec. & G. M.....Natchez, Miss.
C. G. Vaughn, Pur. Agt...... Natchez, Miss.
New Orleans & Southern R.R. 4-8½ g. 66 m. 6 l. 66 c.
J. A. Larnard, Gen. Man.....New Orleans, La.
G. T. Taylor, Pur. Agt.......New Orleans, La.
L. R. Brooks, Supt. M.P....New Orleans, La.
Newport News & Miss. Val. Co. (See Ch. & O. S. W.)
4-9 g. 413 m. 92 l. 3,659 cars.
Newport & Sherman's Valley.
3' g. 31 m. 4 lo, 62 cars.
D. Gring, Gen. Man.&Pur. Agt. Newport, Pa.
C. C. Allen, M. M..............Newport, Pa.
N. Y. & Greenwood Lake Ry. (See N. Y., L. E. & W.)
New York & New England R. R.
4-8¾ g. 527 m. 212 lo. 6,640 cars.
J. T. Odell, Gen. Man...........Boston, Mass.
Edward Mahler, Pur. Agt. ......Boston, Mass.
Thomas Kearsley, M. M..... Norwood, Mass.
N.&W. Div.: P. St. M. Andrews, Supt. Norwich, Ct.
S. F. Whaley, M. M ...... Norwich, Ct.
New York & Northern. 4-8½ g. 61 m. 21 lo. 345 c.
(See N. Y. Central.
N. Y. Central & Hudson River R.R.
4-8½ g. 967 m., 844 lo. 1,049 pass. c., 26,791 frt. c.
J. M. Toucey, Gen. Man...... New York, N. Y.
A. Bourn, Pur. Agt.......... New York, N. Y.
Wm. Buchanan, Supt. M. P.. New York, N. Y.
Jas. Buchanan, Asst. S.M.P. West Albany, N.Y.
G. H. Hazelton, Asst. Supt. M.P..Depew, N.Y
Mohawk Div.:
J. R. Leonard, Supt...........Albany, N. Y
Geo. Van Tassell, M. M.....New York, N. Y.
Jas. Buchanan, M. M......W. Albany, N. Y.
L. Packard, M. C. B......W. Albany, N. Y.
W'n Div.: Geo. H. Burrows, Supt. Buffalo, N. Y.
S. L. White, M. M............ Syracuse, N. Y.
Amos Gould, M.M...... .E. Buffalo, N. Y.
J. Macbeth, M. C. B........E. Buffalo, N. Y.
Peter Smith, M. C. B..... E. Rochester, N. Y
N. Y. Chic.& St.L. R.R 4-8½ g. 524 m. 148 lo. 7,425 c.
A.W. Johnston, Gen. Supt...... Cleveland, O.
M. M. Rodgers, Pur. Agt ....Cleveland, O
John Mackenzie, Supt. M. P .....Cleveland, O.
Eas'tn Div.: W. L. Blair, Supt.....Conneaut, O.
E. A. Miller, M. M.......... Conneaut. O
West'n Div.: C. D. Gorham, Supt. Ft. Wayne, Ind
Geo. James, M. M...........Stony Island, Ill
New York, Lake Erie & Western R. R.
4-8½ g. 1,075 m. 675 lo. 661 pass. c. 29,104 frt. c.
1st V.P.........New York, N.Y.
A. E. Mitchell, Supt. M. P....New York, N. Y.
E. B. Sheffer, Pur. Agt....... New York, N. Y.
N. Y., L. E. & W. Div.:
S. R. Johnson, Gen. R. M... Jersey City, N. J.
East Div.: M.W. Maguire, Supt, Jersey City, N.J
H. A. Childs, M. M........ Jersey City, N. J
Del. Div.: W. L. Derr, Supt...Port Jervis, N. Y.
J. Hainea, M. M ....Port Jervis, N. Y.
Susq. Div.: J. F. Maguire, Supt... Elmira, N. Y.
I. Bond, M. M..............Susquehanna, Pa.
Buff. & B. & S. W. Div.:
C. A. Brunn, Supt...............Buffalo, N. Y.
J. H. Moore, M.M.............. Buffalo. N. Y.
Robert Gunn, For. C. Rep .....Buffalo, N. Y.
Roch. Div.: G.A. Thompson, Supt. Rochester, N.Y.
F. N. Hibbits, M. M.......Rochester, N. Y.
W'n Div.: H. E. Gilpin, Supt. Hornellsville, N.Y
C. P. Weiss, M. M.......Hornellsville, N. Y
Tioga Div.: E. E. Loomis, Supt...Elmira, N. Y.
Bradford Div.: C. V. Merrick, S...Bradford, Pa.
C. P. Weiss, M. M..............Bradford, Pa.
N. Y. & Greenwood L. Ry.
4-8½ g. 51 m. 2 lo. 24 pass. c. 30 frt. c.
N. R.R. of N. J. Div.: 4-8½ g. 26 m. 40 p.c.
B. E. Moody, Supt..........Jersey City, N. J
N. Y., Pa. & O. Div.
4-8½ g. 599 m. 254 lo. 143 pass. c. 9,635 frt. c.
A. M. Tucker, Gen. Man ......Cleveland, O.
J. C. Moorhead, Gen. Supt......Cleveland, O.
W. Lavery, Asst. Supt. M.P..Cleveland, O
1st Div.: J. S. Matson, Supt......Meadville, Pa.
F. B. Smith, M. M............Meadville, Pa.
2d Div.: I. Belnap, Supt................Kent, O.
G. A. Chapin, For. C. R ....Kent, O.
3d & 4th Divs.: C. A. Allen, Supt....Galion, O.
A. W. Ball, M. M...................Galion, O.
Maho'g Div.: H.N. Donaldson, Supt. Youngstown, O.
George Donahue, M. M ....Cleveland. O.
New York, New Haven & Hartford R. R.
4-8½ g. 1,446.95 m. 681 lo. 13,574 cars.
C. H. Platt, Gen. Man......New Haven, Conn.
H. A. Bishop, Pur. Agt ..... New Haven, Ct.
W. H. Fry, Supt. Car Dept.... N. Haven, Ct
Old Colony System:
J. Henney, Jr., Supt. M.P..New Haven, Conn.
E. G. Allen, Gen. Supt..........Boston, Mass.
R. W. Husted, Pur. Agt.........Boston, Mass
Lewis Wyler, M. M..........Hartford, Conn.
J. W. Leary, M. M........New Haven, Conn.
J. F. Brady, M. M.....Harlem River, N. Y.
F. M. Twombly, M. M..........Boston, Mass.
S. P. Willis, M. M.............Boston, Mass.
A. W. Twombly, M. M.......Taunton, Mass.
L. M. Butler, M. M..........Providence, R. I.
N.Y., Ontario & West. Ry. 4-8½ g. 477m. 133 lo., 6,263c.
J. E. Childs, Gen. Man ....New York, N. Y.
Chas. A. Draper, Pur. Agt.... New York, N. Y.
Geo. W. West, Supt. M. P.. Middletown, N Y.
N.Y., Pennsylvania & Ohio R. R. (See N.Y., L.E.&W.)
New York, Philadelphia & Norfolk R. R.
4-9 g. 112 m. 17 lo. 603 c.
W.A. Patton, V.P.G.M.&P.A. Philadelphia, Pa.
C.O. Skidmore, M.M.&M.C.B. Cape Charles, Va
Wm. Caries, Jr., P. A...... Cape Charles, Va.
New York, Providence & Boston R. R. See N. Y., N. H. & H. R. R.
N. Y., Susqueh'na & W'n. 4-9 g. 150 m. 50 lo. 2,912 c
Chas. D. McKelvey, Gen. Supt. Jersey City, N. J.
C. T. Demarest, Pur. Agt.....Jersey City, N.J.
W.C. Ennis, M.M. & C. B. North Paterson, N. J.
Norfolk, Albemarle & Atl. 3 g. 18 m. 4 lo. 49 c
B. P. Holland, Supt.& Pur. Agt. Norfolk, Va.
A. M. Gibbs, M. M.............. Norfolk, Va.
F. O. Clibourne, M. C. B..........Norfolk, Va
Norfolk & Western R. R. 4-9 g. 1,556m. 367lo. 16,365c.
Jos H. Sands, V.P. & Gen. Man..Roanoke, Va.
Wn. G. Div.:
E. T. Burnett, Pur. Agt..............Phila., Pa.
L. P. Ligon, M. M......... Bluefield, W. Va.
R. H. Soule, Supt. M. P.M.&C.B. Roanoke, Va
Norfolk Southern R. R. 4-8½ g. 113 m. 13 lo. 282 c)
M. K. King, Gen. Man. & Supt....Norfolk, Va.
J. P. Jernigan, Pur. Agt..........Norfolk, Va.
R. Joughins, S. M. P..............Berkley, Va
R. W. Barrett, M. C. B............Berkley, Va.
North-Eastern R. R. (S. C.) (See A. Coast Line.
Northern Adirondack Ry. 4-8½ g. 56 m. 6 lo. 600 c.
Alex. Munn, Receiver.........Brooklyn, N. Y.
John Hurd, G.M.& P.A.......Santa Clara, N.Y.
E. Lalime, M. M. & C. B..Santa Clara, N. Y.
Northern California R. R. (See So. Pac. Co.)
Northern Central Ry. (See Penna. R. R.)

North'n Pacific R. R. 4-8½g. 4,495m. 634lo. 18,968c.
J. W. Kendrick, Gen. Man....St. Paul, Minn.
W. G. Pearce, Gen. Pur. Agt...St. Paul, Minn.
J. Hickey, Supt. M. P., M. & R. S. St. Paul, Minn.
J. C. Barber, M.C.B..Como Shps, do.
Minn. Div.:
S. L. Bean, M. M............Brainerd, Minn.
Dak. Div.: C. J. Wilson, Supt...Jamestown, Dak
J. E. Phelan, M. M..................Fargo. Dak.
Manitoba Div.:
G.W. Vanderslice, Sup. Winnipeg, Manitoba.
J.T. Ford, M.M........Winnipeg, Manitoba.
Missouri and Yellow Stone Div.:
J. Dorsey, Supt................Glendive, Mont.
M. M.....Glendive, Mont.
Montana Div.:
J. D. Finn, Supt ....Livingston, Mont.
Angus Brown, Div. M.M...Livingston, Mont.
R. M. Div.: W.H. Brimson, Supt. Missoula, Mont.
A. Harrity, M. M.............Missoula, Mont.
Idaho Div.: F. W. Gilbert, Supt. Spokane, Wash.
Wm. Moir, M. M..............Spokane, Wash.
Pac. Div.:
Jos. McCabe, Supt............Tacoma, Wash.
H. H. Warner, M. M........Excelsior, Wash.
North Pacific Coast R. R. 3 g. 94 m. 12 lo. 391 cars.
J. B. Stetson, G. M........San Francisco, Cal.
W. F. Russell, Pur. Agt ...San Francisco, Cal.
W. J. Thomas, M. M. & M. C. B. Sausalito, Cal.
Northwestern Ohio Ry. (See Pa. Co.)
North Galveston, Houston & Kansas City Ry.
4-8½ g. 16 m. 2 l. 18 cars.
R. A. Reese, Rec. & G. M. N. Galveston, Tex.
J. H. Taylor, Supt.&M. M. N. Galveston, Tex.

O

Ohio Central Lines:
Toledo & Ohio Central Ry. 4-8½ g. 359 m. 85 lo. 6,494 cars.
Kanawha & Michigan Ry. 4-8½g. 168 m. 15 lo. 600 cars.
J. M. Ferris, Gen. Man...........Toledo, O.
H. A. Cooper, Pur. Agt............Toledo, O.
J. B. Morgan, M. M. & M. C. B. ..Toledo, O.
Ohio & Big Sandy R. R. (See C. & O. Ry. Co.)
Ohio & Mississippi Ry. (See B. & O Southwestern).
4-9 g. 636 m. 124 lo. 3,823 cars
Ohio River R. R. 4-8½ g. 225 m. 23 lo. 1,303 cars.
Gen. Man..Parkersburg, W.Va.
C. L. Williams, A. S.& P.A. Parkersburg, W.Va.
J.B. Dorsey, M. M........Parkersburg, W. Va.
Ohio Southern R. R. 4-9 g. 225 m. 30 lo. 6,265 c.
G. W. Saul, Gen. Man..........Springfield, O
Horner T. Dick, Pur. Agt......Springfield, O.
A. J. Ball, M. M. & M. C. B Springfield, O.
Ohio Valley Ry. (See C. & O. Southwestern).
4-9 g. 136 m. 11 l. 346 c.
Old Colony R. R. 4-8½ g. 603 m. 238 lo. 4,917 cars.
(See N. Y., N. H. & H.)
Omaha & St. Louis Ry. 4-8½ g. 145 m. 15 lo. 422 c.
John F. Barnard, Rec......... Stanberry, Mo.
F. P. Boatman. Pur. Agt.&M.M. Stanberry, Mo.
Oregon & California R. R. (See Southern Pac. Co.
Ore. Imp. Co. 3 and 4-8½ g. 144 m. 18 lo. 318 c.
Seattle & Northern Ry. 4-8½ g. 36 m. 3 lo. 40 c.
C. J. Smith, Gen. Man..........Seattle, Wash.
W. E. Nichols, Pur. Agt.......Seattle, Wash.
D. O'Leary, M. M...............Seattle, Wash
Oregon Pacific R. R. 4-8½ g. 138 m. 13 lo. 343 c.
Charles Clark, Receirer.........Corvallis, Ore.
H. E. Chipman, M. M. & M.C.B. Yaquina, Ore.
Ottawa & Gatineau Ry.
4-8½ g. 58 m. 4 lo. 44 cars.
J. T. Prince, Supt. & P. A..... Ottawa, Ont.
Jas. Kay, M. M. & M. C. B....Ottawa, Ont.

P

Pacific Coast Ry. Co. 3 g. 76 m. 6 lo. 195 c.
C.O. Johnson, Supt.&P.A. San Luis Obispo, Cal.
J. Lind, M. M.............San Luis Obispo, Cal.
J.M. Vincent, For. Car Shop. San Luis Obispo, Cal.
Paducah, Tennessee & Alabama R. R. & Tenn. Midland Ry.
4-8½ g. 255 m. 16 l. 583 cars.
W. J. Hills, Supt & Pur. Agt...Paducah, Ky.
A. S. Chute, M. M..............Paducah, Ky.
J. W. Troutman, M. C. B......Paducah, Ky.
Panama R. R. 5 g. 47 m. 38 lo. 1,436 cars
A. L. Rives, Gen. Supt.......Colon, U. S Col.
G. Reynaud, Pur. Agt.........New York, N. Y.
D. G. Mott, M. M & M. C. B..Colon, U. S. Col
Pecos Val. & Pecos River R.R. 4-8½g. 164m. 6 l. 60c.
Jeff. N. Miller, G. M. & P. A. Eddy, New Mex.
G. F. Miller, M.M.&M.C.B. Eddy, New Mex.
Pennsylvania & North Western R. R.
4-9 g. 73 m. 45 lo. 1,570 cars.
F. S. Lewis, Gen. Man.&Pur. Agt..Phila., Pa.
Geo. Van Brunt, M. M..........Bellwood, Pa.
A. Zimmerman, M. C. B...... Bellwood, Pa.
Pennsylvania Company operating
Pitts., Fort Wayne & Chicago; Massillon & Clev So. Chi. & South'n; State Line & Indiana City; Pittsburgh, Youngstown & Ashtabula; Cleve. & Pitts.; Erie & Pitts.; Newcastle & Bea. Val., and T. W. V. & O.; Pittsburgh, Ohio Valley & Cincinnati.
4-9 g. 1,076 m. 508 lo. 35,648 cars.
Gen. Divs. (1), (2), (3), (4) and (5).
J. T. Brooks, 2d V.-Pres. .....Pittsburgh, Pa.
Joseph Wood, Gen. Man.. ....Pittsburgh, Pa
H. O. Hukill, Pur. Agt........Pittsburgh, Pa.
Geo. L. Potter, Supt. M. P ....Fort Wayne, Ind.
(1) E'n Div.: 205m.
A. B. Starr, Supt..........Allegheny City, Pa.
W. F. Beardsley, M. M. Allegheny City, Pa.
Geo. P. Sweeley, M. M....... Crestline, O.
(2) W'n Div.: 304 m., C. D. Law, Supt. Ft. Wayne, Ind.
W. W. Atterbury, M. M....Ft. Wayne, Ind.
J. A. Graham, For. Car Rep. Ft. Wayne, Ind,
3) Erie & Ashtabula Div., 224 m.
John M. Kimball, Supt..Lawrence Junc., Pa.
G. J. Parkin, M. M................Erie, Pa.
(4) Cleveland & Pittsb'g Div: 217 m.
L. F. Loree, Supt..............Cleveland, O.
T. F. Butler, M. M............Wellsville, Ohio.
(5) Toledo Div.: 126 m., J.S. Morris, Supt. Toledo, O.
W. M. Lowe, M. M................Toledo, O.
Pennsylvania R. R. Co.'s Roads. (7 Gen. Divs.)
4-9 g. 4,045 m. 2,283 loco. 82,304 cars.
S. M. Prevost, Gen. Man.....Philadelphia, Pa
Samuel Porcher, Ast. Pur. Agt. Philadelphia, Pa.
F. D. Casanave, Gen. S. M. P......Altoona, Pa.
1(Pennsylvania R. R. Divs.
Frank L. Sheppard, Gen. Supt Altoona, Pa.
J. M. Wallis, Supt. M. P........Altoona, Pa.
G. W. Strattan, M. M.......... Altoona, Pa.
Jno. P. Levan, Gen. For. C. Shps. Altoona, Pa.
Phila. Div.: Tho. Gucker, Supt. ..W. Phila., Pa.
H. D. Garrett, M. M...W. Philadelphia, Pa.
I. W. Van Houten, Gen. For. C.S. W. Phila., Pa.
Schuylkill Div..
W.H. Meyers, Supt.............Reading, Pa.
Mid. Div.: Frank Ellmaker, Supt. Harrisburg, Pa.
E. L. Caum, M. M...........Harrisburg, Pa.
W. F. Eberle, Gen.....For. C.S. Ha'burg, Pa.
Altoona Div.: Supt. Altoona, Pa.
Pitts. Div.: Robert Pitcairn, Supt..Pittsburgh, Pa.
D. O. Shaver, M. M...........Pittsburgh, Pa.
W. Pa. Div.: D. M. Watt, Supt...Allegheny City.
Wm. B. Norris, M. M..........Blairsville, Pa.
M. H. Fails, Gen. For. C. S....Blairsville, Pa.
Fred. Div.: A. W. Moss, Supt.........York, Pa.
A. O. Baker, M. M...........Columbia, Pa.
Tyrone Div.: S. S. Blair, Supt.......Tyrone, Pa.
J. A. Beamer, M. M..............Tyrone, Pa.
Lew. Div.: A. E. Reed, Supt....Lewistown, Pa.
Isaiah Paxson, M. M......Lewistown, Pa.
Bed. Div.: Victor Wierman, Supt. Bedford, Pa.
And. Green, Fore. of Shop....State Line, Pa.
Monong. Div.: D. H. Lovell, Supt. Pittsburgh, Pa.
Wm. Lininger, Gen. Foreman Pittsburgh, Pa.
2) United R. Rs. of N. J. Divs.:
F. Wolcott Jackson, Gen. Supt. Jersey City, N.J.
H. S. Hayward, Supt. M.P..Jersey City, N. J.
H. Canfield, M. M.........Hoboken, N. J.
N.Y. Div.: Jos. Crawford, Supt...Jersey City, N.J.
H. Canfield, M. M.......... Hoboken, N. J.
J. W. Sanford, M. M......Meadows, N. Y.
Belv. Div.: A. P. Gest, Supt. Lambertville, N.J.
R. McDowell, M. M.......Lambertville, N. J.
Amboy Div.: W. Brown, Supt.....Camden, N.J.
Thos. Kerr, M. M..............So. Amboy, N. J.

R. Hill, *M. M*.... ....Camden, N. J.
W. McAlister, *M. M*.... ....Camden, N. J
P. S. Bogart, *Gen. For*......So. Amboy, N. J
(2½) Camden & Atlantic:
A. O. Dayton, *Supt*.. .... Camden, N. J.
(3) West Jersey R. R.
A. O. Dayton, *Gen. Supt*.........Camden, N. J
(4) Phila., Wilm. & Balt. R.R.
H. F. Kenney, *Gen. Supt*. . ..Philadelphia, Pa.
R. E. Marshall, *S. M. P* ...... Philadelphia. Pa.
C. G. Turner, *M. M*............Wilmington, Del.
(5 Phila. & Erie R. R. Divs.:
R. Neilson, *Gen. Supt*.... ...Williamsport, Pa.
Edw. D. Nelson, *Supt.Mo.Po.*Williamsport. Pa.
6) Northern Central Ry.
Robert Neilson, *Gen. Supt*...Williamsport, Pa
Edw. D. Nelson, *Supt. M. P*..Williamsport, Pa.
J. M. Coale, *M. M*................Baltimore, Md.
G. W. Demarest, *Gen. For*.. Baltimore, Md.
Elm. & Can. Divs.: S. Meade, *Supt*..Elmira, N.Y.
Jas. Strode, *M. M*..... ....Elmira, N. Y.
J. C. Dyott, *Gen. For*...... ...Elmira, N. Y
Pensacola, Ala. & Tenn. Ry. 5 g. 26 m. 8 lo. 93 cars
S. R. Dishman, *Pres. & P. A*. .Pensacola, Fla.
Peoria & Pekin Union Ry. 4-8½ g. 20 m. 17 lo. 260 c.
J. E. Palmer,*Gen. Supt. & Pur.Agt*.Peoria, Ill
Jas. W. Hill, *M. M*................ Peoria, Ill.
John G. Evans, *Fore. Car Rep* ...Peoria, Ill.
Peoria, Decatur & Evansville Ry.
4-8½ g. 257 m. 30 lo. 1,856 cars.
E. O. Hopkins, *Gen. Man*.....Evansville, Ind.
H. W. Matters, *Pur. Agt*........Princeton. Ind.
C. C. Robinson, *M. M., M. C. B*...Mattoon, Ill.
Perkiomen Ry. 4-8½ g. 39 m. Locos. and cars leased from Reading R. R. Co.
H. Boyd, *P. A*................ .Norristown, Pa.
Philadelphia & Erie R. R. (*See Penna. R. R.; (5) Div.*)
Phila. Harrisb.&Pittsb.R.R. (*See Phila.&Read.R.R.*)
Philadelphia & Reading R. R.
4-8½ g. 1,190 m. 781 lo. 30,073 cars.
A. Foster, *Pur. Agt* .. ..Philadelphia, Pa.
L. B. Paxson, *Supt. M.P. & R.E*...Reading, Pa.
J. H. Rankin, *M. C. B*. ... . Reading, Pa
Main Line Div.: I.A.Sweigard,*G.Supt*.Phila.,Pa.
G. F. H. Von Wrede, *M. M*..Philadelphia, Pa.
Phila., Reading & New England.
4-8½ g. 181 m. 43 l. 637 cars.
Jas. K. O. Sherwood, *Rec*.. New York, N.Y.
C. M. Lawler, *G. M.&Pur.A*.Hartford, Conn.
E.M.Humstone,*M.M.&M.C.B*.Hartf'd,Conn.
Phila., Newtown & New York R. R. 4-8½ g. 23 m.
W. M. Geary, *Supt*.............Philadelphia, Pa.
Howard Boyd, *Pur. Agt* ......Norristown, Pa.
Phila., Wilmington & Balt. R. R. (*See Penna. R. R.*
Piedmont Air Line (*See Rich. & Danville*.
Pine Bluff & Eastern Ry. 3 ft. g. 33 m. 2 lo. 21 c.
H. E. Martin, *G. M. & P.A*. Pine Bluff, Ark.
W. H. Hall, *M. M*.......... Pine Bluff, Ark.
R. H. Strong, *M. C. B*.........Pine Bluff, Ark.
Pittsburgh. Akron & Western R. R.
4-8½ g. 165 m. 8 lo. 250 c.
J.H. Sample,*Gen.Supt.& Pur.Agt*.Akron, O.
B. F. Marshall, *M. C. B. & M. M*...Delphos, O.
Pitts.& Castle Shannon R.R.3-4 g.7 m. 4 lo. 10 pass.
E. J. Reamer,*Supt. & Pur.Agt*.Pittsburgh, Pa.
Holmes Ward, *M. M*......Castle Shannon, Pa.
R. A. A. Patterson, *M. C. B* ..Pittsburgh, Pa.
Pitts.& Lake Erie R. R. and lesses of Pitts., McK. & Yough R. R. 4-8½ g. 399 m. 103 lo. 5,352 c
R. Evans, *Pur. Agt*. . ... Pittsburgh. Pa.
L. H. Turner, *M. M. & M. C. B.*, McKee's Rocks P. O., Pa.
Pitts. & West. Ry.: 3 & 4-8½ g. 353m. 119 lo. 5,435 c.
R. B. Campbell, *G. M*.........,Baltimore, Md.
J.V. Patton, *Gen. Supt*....... Pittsburgh, Pa.
R. Finney, Jr., *Pur. Agt*......Allegheny, Pa.
Thos. Anderson, *M. C. B*.......Allegheny, Pa.
Wm. Truby, *Supt. West. & Lake Div.* Allegheny, Pa.
I. N. Kalbaugh, *M. M*......... Allegheny, Pa.
Pittsburgh, Chartiers & Youghiogheny Ry.
4-8¾ g. 17 m. 7 lo. 95 c.
J. B. Safford, *Supt*........McKee's Rocks, Pa.
Pittsburgh,Bradford & Buffalo Ry. (*See Pitts.& West*
Pittsburgh, Cincinnati, Chicago & St. Louis Ry.
4-9 g. 1,473 m. 501 lo. 12,525 cars.
J. T. Brooks, *2d V. Pres*.......Pittsburgh, Pa.
Jos. Wood, *Gen. Man* ....Pittsburgh, Pa.
H. O. Hukillan, *Pur. Agt*......Pittsburgh, Pa.
S. P. Bush, *Supt. M. P*......... .Columbus, O.
B. Fitzpatrick, *M. M*..............Columbus, O
John Cummerford, *For. C. S*....Columbus, O.
Pittsb. Div.: J. J. Turner, *Supt*.Pittsburgh, Pa.
W. C. Arp, *M. M* ....Dennison, O.
J. B. Swann, *For. C. S*............Dennison, O
Ind.Div.: F.G.Darlington,*Supt*.Indianapolis,Ind.
Wm. Swanston, *M. M*......Indianapolis, Ind.
P. H. McGraw, *For. C. S*....Indianapolis, Ind.
Chic. Div.: C. H. Walbon, *Supt*.Logansport,Ind.
W. C. Pennock, *M. M*....... Logansport, Ind.
J. Hannon, *For. C. S*........Logansport, Ind.
Indianapolis & Vincennes R. R.
M. W. Mansfield, *Supt*......Indianapolis, Ind.
Jas. Landers, *Road For.Eng*.Indianapolis,Ind.
Pittsburgh, Ft.Wayne & Chicago Ry.(*See Penna.Co.*)
Pittsburgh,Marion & Chicago. 4-8½ g.25 m. 3 l. 43c.
C. H. Smith, *Gen. Man*........New Lisbon, O.
R. Beeson. *M. M. & M. C. B*.New Galilee, Pa.
Pittsburgh. McK. & Yough. (*See P. & L. E.*
Pittsburgh, Shenango & Lake Erie Ry.
4-8½ g. 184 m. 26 lo. 1,400 c.
J. T. Blair, *G. Man*........ .....Greenville, Pa
W. G. Sargeant, *Pur. Agt*....... Meadville, Pa.
E. B. Gilbert......*M.M. & C. B*.Shenango, Pa.
Pittsburgh,Youngstown &Ashtabula.(*See Penn.Co.*)
The Plant System, operating the Savannah, Florida & Western Ry.
4-9 g. 569 m. 92 lo. 2,228 cars.
R. G. Fleming,*Pur.Agt.&Supt*..Savannah,Ga.
Wm. Rutherford, *Supt. M. P*..Savannah, Ga.
G. M. Riley, *M. M*........... .Savannah, Ga.
South Florida R. R. Co. 4-9 g. 306 m 32 lo. 663c.
A. B. Allen. *M. C. B*........ ......Sanford, Fla.
Charleston & Savannah Ry.
4-8½ g. 120 m. 23 lo 751 cars.
C. S. Gadsden, *Supt*. ... Charleston, S. C.
M. F. Loughman, *Pur. Agt*.New York N.Y.
G. M. D. Riley,*M.M & M.C.B* Savannah,Ga.
Alabama Midland Ry.
4-8½ g. 208 m 18 lo. 450 cars.
B. Dunham, *G.Supt.& P A*.Montgomery,Ala.
T. M. McDonough, *S. M*. Montgomery, Ala.
Brunswick & Western.
4-9 g. 170 m. 23 lo. 591 cars.
G. W. Haines, *S. & P. A*. ...Brunswick, Ga.
D. B. Overton,*M.M.&M.C.B*.Brunswick,Ga.
Silver Springs, Ocala & Gulf Ry.
4-8½ g. 80 m. 4 lo 26 c.
O. G. Finch, *Asst. Supt*...........Ocala, Fla
Pontiac, Oxford & Northern R. R.
4-8½ g. 100 m. 6 lo. 121 c.
Wm. C. Sanford, *Gen. Supt*.... Pontiac, Mich
W. C. Sanford, *Pur. Agt*..... ..Pontiac, Mich.
F. H. Neward, *M. M*........... ...Pontiac, Mich
Pontiac Pacific Junc. Ry. 4-8½ g. 60 m. 4 lo. 33 cars
H. J. Benner, *Gen. Man*. ... Montreal. Can
H. L. Maltby, *P. A*........ ....Montreal, Can.
Jas. Kay, *M.M.&M. C. B*........Aylmer, Can.
Port Royal& Augusta Ry. 4-9g. 112 m. 15 lo. 142 c.
Jno. H. Averill. *Rec* . ...Port Royal, S.C.
C. N. Averill,*Pur.Agt*......Port Royal, S. C.
Jno. S. Cook, *M. M*........ .. Augusta, Ga.
E. S. Schutz, *M. C. B*..... . .. Augusta, Ga.
Port Royal & Western Carolina Ry.
4-9 g. 227 m. 14 lo. 120 cars.
John B. Cleveland, *Rec*..... .....Augusta, Ga.
J. W. Corner, *Pur.Agt*........Savannah, Ga.
W. H. Stubb, *M. M*............. Augusta, Ga.
Portland & Rochester R.R. 4-8½ g.55 m. 12 lo. 310c
J. W. Peters, *Supt. & Pur Agt*...Portland, Me
E. H. C. Tompson. *M.M.&M.C.B*.Portland, Me
Portland & Rumford Falls Ry.
4-8½ g. 57 m. 6 l. 86 cars.
L.L.Lincoln,*S.,G.M.&P.A*.RumfordFallsMe.
W. R. Davis, *M. M*.......Rumford Falls, Me.
Port Jervis, Monticello & New York.
4-8¼ g. 42 m. 3 lo. 18 cars.
B. Ryall, *Rec.& Gen. Man*.Port Jervis, N. Y.
A. Vanaken, *M. M*......... Port Jervis, N. Y.

Potomac, Fred.'g & Pied. R R 3 g. 38 m. 2lo.,37 c.
W. H. Richards. *G. M.&P.A*.Fred'cksburg,Va.
W. P. Johnson. *M. M*. ....Fredericksburg, Va.
W. C. Wilkins, *M. C. B*...Fredericksburg,Va.
Poughkeepsie & Eastern.
4-8½ g. 40 m. 5 l. 59 c.
W. H. Sheldon,*G.S & P.A*.Poughkeepsie N.Y
J. L. Donaldson,*P.M.M*.Poughkeepsie, N. Y.
Powellton & Pocahontas R. R.
4-8½ g. 9 m. 2 lo. 36 cars.
E. Powell, *Pres*.. ....Powellton, W. Va.
J. R. Thomas, *Pur. Agt* ...Powellton, W Va.
W. T. Layton, *M. M*.......Powellton, W. Va.
C. Dotson, *M. C. B*.........Powellton, W Va.
Prescott & Arizona Cent. Ry. 4-8½ g. 74 m. 3 l. 20c.
Wm. N. Kelly *Rec* .. .. Prescott, Ariz.
Tho.S.Bullock,*Pres.& G.Man*.New York.N.Y.
W. B. Jones, *G. S. & P. A* Prescott, Ariz.
E. Folliatt, *M. M* ....Prescott. Ariz.
Prince Edward Island Ry. (*See Intercolonial Ry*).
Profile & Franconia Notch R. R. (*See Concord & Montreal R. R.*)
Prov. & Springfield R.R. Leased to N.Y.& N.E.R.R.
Pullman Palace Car Co. 2,573 passenger cars.
Geo M. Pullman, *Pres*............Chicago, Ill
Horace Porter, *V. Pres*.......New York, N. Y.
T. H. Wickes, *2d V. Pres* .. ....Chicago, Ill.
Geo. F. Brown. *Gen. Man*... .....Chicago, Ill.
Wm. A. Angell, *West'n Pur. Agt*..Chicago.Ill
S.W.Bretzfield,*East'n Pur.A*..New York, N.Y
H. Middleton. *Manager* Pullman Works, Pullman, Ill.
H. H. Sessions, *Chief Mich Eng*.Chicago, Ill.

Q

Quebec & Lake S. John Ry.4-8½ g.190 m.14 l.314 c.
J. G. Scott, *Manager* ....Quebec, Can
A. Vallerand, *Pur. Agt*....St, Raymond, P. Q.
Jno. Campbell, *Act. M. M*.St. Raymond, P. Q.
Quebec Central Ry. 4-8½g.158m. 12 lo. 406 cars
Frank Grundy, *Gen. Man*...Sherbrooke, P. Q.
A. H. Anderson, *P. A*.......Sherbrooke, P. Q.
Jas.Seiveright,*M. M.&M.C.B*.Sherbrooke,P.Q.
Queen & Crescent Route.
4-8½ g. 1,158 m. 267 l. 10,460 c.
Richard Carroll, *Gen. Man*.... ..Cincinnati. O.
G. W. Stevens, *Pur. Agt*..... ....Cincinnati, O.
G. W. Cushing, *M. M. & M.C.B* .Ludlow. Ky.
C., N. O. & T. P.: 4-8½ g. 336 m. 104 l. 3,956 c.
A. Griggs, *Supt*....... .....Somerset, Ky.
J. W. Fowle, *M. M*............Somerset, Ky.
P. H. Schreiber, *M. M*... .Chattanooga, Tenn.
Ala. Gr. So. Div.: 4-8½ g. 295 m. 59 l. 3,662 c.
A. J. Frazier, *Supt*........Birmingham. Ala.
J. P. McCuen, *M. M*... . ..Birmingham, Ala.
N. O. & N. E. Div. 4-8½ g. 196 m. 44 l. 1,645 c
D. D. Curran, *Supt*. ....New Orleans, La.
J. G. Tomlinson, *M. M*.......Meridian, Miss.
Ala. & Vicks. Div. 4-8½ g. 142 m. 14 l. 504 c.
W. W. Bond, *Supt*..........Vicksburg, Miss.
J. G. Tomlinson *M. M*.. .....Meridian, Miss.
V. S. & P. Div. 4-8½ g. 189 m. 16 l. 693 c.
W. W. Bond, *Supt* .... ..Vicksburg, Miss.
John H. Murphy. *M. M* ... .Monroe, La.
Eastern Ohio R. R.: 4-8½ g. 19 m. 2 lo. 205 cars.
W. H. Stevens, *Supt. & P. A*.Cumberland, O.
J. W. Gregg. *M. M*..... ......Cumberland. O.
Quincy, Omaha & Kan.City Ry.4-8½g.138m.9l.144c.
Gen. Man..... ....Quincy, Ill.
C. E. Soule, *Supt. & Pur. Agt*.. .Quincy, Ill.
J. Voorhis, *M. M*...................Quincy, Ill.

R

Raritan River R. R. 4-8½ g. 19 m. 3 lo. 31 c.
Frank H. Earle, *Pres.&G.M*.Jersey City,N.J.
F. Hoffman, *Supt*........South Amboy, N. J.
C. H. Sisson, *P. A* ... .Jersey City, N J.
Raleigh & Western Ry. Co.
4-9 g. 92 m. 1 lo. 28 cars.
S. A. Henszey, *G. M. & P. A*...Egypt, N. C.
C. F. Pendleton, *Act. Supt*.... ..Egypt, N C.
Richmond & Danville R. R. Co.: (*See Southern Ry.*)
Richmond & Petersburg R.R (*See A l. Coast Line.*)
Richmond, Fredericksburg & Potomac R. R.
4-9 g. 81 m. 22 lo. 110 cars.
T. L. Courtney, *Supt.& Pur. A*.Richmond, Va.
J. T. Bryant *M. M*.............. Richmond, Va.
Richmond. Nicholasville, Irome & Beattyville Ry.
4—8½ g. 61 m. 4 lo. 28 cars.
John MacLead, *Rec*...........Louisville. Ky.
W. H. Adams, *Supt*..... ... . Richmond, Ky.
K. MacLeod, *P. A*...... ..... Louisville, Ky.
John Farrell. *Gen. Fore*......Richmond, Ky.
Rio Grande Western Ry.
4-8½ g. 531 m. 77 lo. 771 c.
D. C. Dodge. *Gen. Man*....... ...Denver. Colo.
W. P. McElroy, *P. A*.... Salt Lake City, Utah.
Quimby Lamplugh,*M.M*.Salt Lake City, Utah
Rock Island & Peoria Ry. 4-8½ g. 113 m. 19 l. 530 c
H. B. Sudlow, *Supt. & P. A*....Rock Island, Ill
Joseph Elder, *M. M.& M.C. B*.....Peoria, Ill.
Rome, Watertown & Ogdensburg R. R. N. Y. C. & H. R. R. R. Lessee.
4-8½ g. 711 m. 100 lo. 3,934 cars.
J. M. Torrey, *Gen.Man*. . New York, N. Y.
E. G. Russell, *Supt* ....Watertown, N. Y.
Allan Bourn, *Pur. Agt*..... .New York, N. Y.
Wm. Buchanan, *S. M. P.R.S*...New York.N.Y
P. T. Lonergan, *M. M* ....Oswego, N. Y.

S

Sabine & East Texas Ry. (*See So. Pac.*
Saginaw, Tuscola & Huron R.R.
4-8½ g. 67 m. 9 l. 189 c.
Sanford Keeler, *G. M. & P.A*.Saginaw, Mich.
M. V. Meredith,*Gen. Supt*..E. Saginaw, Mich.
Wm. L. Kerr, *Gen. For*....E. Saginaw, Mich.
Saginaw Valley & St.Louis R.R. (*Det.Lan.& North'n.*)
St. Augustine & South Beach Ry. 3 g. 5 m. 2 l. 2 c.
Allen Wood. *Gen. Man. & P. A.*, St. Augustine, Fla.
W. J. Mack, *M. M*............Anastasia, Fla.
St. Johns & Lake Eustis Ry.
3 g. 52 m. 1 lo. 1 car.
C. P. Lovell, *Rec. & Gen. Man*.Leesburg,Fla.
P. L. McAteer, *Pur. Agt*. ....Leesburg, Fla.
D. B Young, *M. M*..... .. ....Leesburg, Fla.
St. Johnsbury & Lake Champlain R. R.
4-8½ g. 132 m. 18 lo. 340 cars.
H. E. Folsom, *Supt*...........Lyndonville, Vt.
J. A. Farrington, *Pur. Agt*.....Boston, Mass.
A. R. Barrett, *Supt. M. P*.... ..Boston, Mass.
J. T. Chamberlain, *M. C. B*......Boston, Mass.
St. Joseph & Grand Island R. R.
4-8½ g. 454 m. 35 lo. 1,450 cars.
W. P. Robinson,Jr.,*Gen. Man*..St.Joseph,Mo.
G. D. Berry, *Pur.Agt*...........St. Joseph, Mo.
A. C. Hinckley,*M. M*..... ....St. Joseph, Mo.
St. Louis, Cape Girardeau & Ft. Smith Ry.
4-8½. g. 94 m. 9 l. 100 cars.
E. S. McCarty, *Gen. Man*.Cape Girardeau, Mo.
Louis Houck, *Rec.& P.A*.Cape Girardeau, Mo.
A.W. Quackenbush,*M.M*.Cape Girardeau, Mo.
St. Louis & Hannibal. 4-8½ g. 104 m. 7 lo. 175 c.
J. A. Jordan,*Gen Man.&P.A*..Hannibal, Mo.
Wm. P. Reidler, *M.M. & C. B*..Hannibal. Mo.
St. Louis & San Francisco Ry.
4-8½ g. 1,441 m. 195 lo. 5,929 c.
H. L. Morrill, *Gen. Man*.. ....St. Louis. Mo.
E. T. Smith, *Pur. Agt*.... ....St. Louis, Mo.
J. R. Groves, *Supt.R.S. & C. B*.Springfield. Mo
St. Louis, Alton & Springfield R. R. (*See St. L., C. & St. P. Ry.*)
St. Louis, Alton & Terre Haute R. R.
4-8½ g. 240 m. 42 lo. 4,267 c.
G. W. Parker, *Pres. & G. M*....St. Louis, Mo.
C. F. Parker, *Pur. Agt* ....St. Louis, Mo.
J. W. Stokes, *M. M*....., E. St. Louis, Ill.
St. Louis, Chicago & St. P. Ry. Co.
4-8½ g. 110 m. 15 lo. 1,000 cars.
I. W. Fowler, *Gen. Supt*....... Springfield, Ill
B. L. Babb, *Supt. Car Serv* ...Jerseyville Ill
W. E. Killen, *M. M*.............Jerseyville, Ill.
St. Louis & Eastern,
4—8½ g, 41 m. (inc. S. L. & P.) 4lo. 728 c,
Wm. E. Guy, *G. M. & P.A*....St Louis, Mo.
St. Louis Southwestern Ry. Co.
4-8½ g. 1,223 m. 136 lo 4,465 cars.
J. A. Edson, *Supt*............Texarkana, Ark.
A. Gould, *P. A*..................St. Louis, Mo.
R. M. Gailbraith, *Gen. M. M*.Pine Bluff, Ark.
St. Louis, Iron Mt. & So'n Ry. (*See Mo Pac.; (4) Div.*

St. Louis, Kan. City & Colorado R. R.
4-8½ g. 66 m. 2 l. 52 cars.
Adiel Sherwood, *Receiver*.....St. Louis. Mo.
E. O. Faulkner, *Man. & Pur. A*.St. Louis, Mo.
St. L., Keokuk & No.-W'n. Ry. (*See C., B. & Q.*)
St Paul & Duluth R.R. 4-8½ g. 247 m. 66 lo. 2,465 c.
A. B. Plough, *Gen. Man*..... ...St. Paul, Minn.
W. N. Schoff, *Pur. Agt*..... ....St. Paul, Minn
G. D. Brooke, *M. M. & M. C. B*...St. Paul. Minn
Salisbury & Harvey Ry. 4-8½ m. 52 m 2 lo. 35c.
A. Sherwood, *G. S. & P. A*....Hillsboro, N. B.
San Antonio & Aransas Pass Ry.
4-8½ g. 687 m. 60 lo. 1,543 cars.
M. D. Monserrate.*Gen.Man*.San Antonio,Tex
T. B. Palfrey, *P.A*. .... San Antonio, Tex
G. W. Butcher, *M. M*........San Antonio, Tex.
San Diego, Cuyamaca & Eastern Ry.
4-8½ g. 26 m. 2 lo. 39 cars.
W. S. Waterman, *G M*.......San Diego, Cal.
Sandy River R. R. 2 g. 18 m. 4 lo. 35 cars.
Josiah Maxey, *G. M*.............Gardiner, Me.
P. H. Winslow, *Pur. Agt* ......Gardiner, Me.
E. Greenwood, *M. M. & C. B*......Phillips, Me.
Sandusky & Columbus Short Line. (*See Col. S. & H. Ry. Co.*)
Sanford & St Petersburg R. R.
3 g. 153 m. 9 lo. 122 cars
Wm. Macleod, *G. M*...... ......Oakland, Fla.
A J. Grant, *Supt. & P. A*..... .Oakland, Fla.
J. F. Sheahan, *M. M*............Oakland, Fla.
San Francisco & No. Pac. Ry.
4-8½ g. 165 m. 18 lo. 538 cars.
H. C. Whiting. *G. M.& P. A*.San Francisco, Cal
John Bonner, *M M*..... ......,..Tiburon, Cal.
J. P. Samuelson *M. C. B*. ....Tiburon, Cal.
San Pete Valley R. R. 3 g. 51 m. 3 lo. 45 cars
T. Bruback, *Gen.Man*....Salt Lake City, U. T.
H. S. Kerr, *Supt. & P. A*..Salt Lake City,Ut.
Wm. Watson, *M. M* ....Salt Lake City, Ut.
C. W. Wood, *M. C. B*......Salt Lake City, Ut
Santa Fe Southern Ry. 3 g. 40 m. 3 lo. 42 cars.
T. J. Helm, *Gen. Man*. ....Santa Fe, N. Mex.
Santa Fe, Prescott & Phœnix Ry. Co.
4-8½ g. 60 m 8 lo. 91 cars.
G.W. Vauglin, *G. M. & P. A*..Prescott, Ariz.
Wm. Patterson, *M.M*......... Prescott, Ariz
Sault Ste. Marie & Northwestern R. R. (*See Chi. St. P. Minn. & Omaha Ry.*)
4-8½ g. 28 m. 2 lo. 15 cars.
Savannah, Americus & Montgomery.
4-8½ g. 300 m. 26 lo. 1,314 cars.
Cecil Gabbett, *Gen. Man. & Pur. Agt*. Americus, Ga.
E. Worsick, *M. M*............Americus. Ga
Savannah, Florida & W'n Ry. (*See Plant System.*.
Sav., Griffin & No. Ala. R. R. *Op. by Central (Ga.)*
Seaboard Air Line, operating
Seaboard & Roanoke, Roanoke & Tar River, Raleigh & Gaston, Raleigh & Augusta Air Line, Louisburg, Carolina Central, Durham & Northern and Georgia, Carolina & Northern Railroads.
Seaboard Air Line. 4-9 g. 927 m. 100 l. 2,109 c.
E. St. John, *Gen. Man*......Portsmouth, Va.
L. T. Myers, *Gen. Supt.&P.A*.Portsmouth, Va.
D. W. Ballantine, *M. C. B*....Portsmouth, Va.
James Maglenn, *Supt. M. P* .. Raleigh. N. C.
B. S. Shaw, *M. M*..............Raleigh, N. C.
Raleigh & Gaston and Louisburg R. R.
4-9 g. 107 m. 38 l. 797 c.
Raleigh & Augusta Air Line. 4-9g.97m.33l. 102c.
Wm. Smith, *Supt*..............Raleigh, N. C.
B. S. Shaw, *M. M* .... Raleigh, N. C.
Georgia, Carolina & Northern. 4-9g.265m.5l.170c.
Seaboard Ry. of Alabama. 3 g. 31 m. 6 lo. 140 c.
W. Best. *G. M*..............New York, N. Y.
J. Penney, *M.M.& M. C. B*....Fairfield, Ala.
Seattle, Lake Shore & Eastern Ry. (*See Northern Pacific Co.*)
Seattle & Northern Ry. (*See Ore Improvem't Co.*)
Sharpsville R. R. 4-8¾ g. 23 m. 4 lo. 4 cars.
J. V. Patton, *P. & Gen.Man*.. ..Pittsburgh,Pa.
S. K. Harris, *Pur. Agt*........Sharpsville, Pa.
Jas. Glass, *M.M*.......... ....Sharpsville, Pa.
Shepaug, Litchfield & Northern R. R.
4-8½ g. 38 m. 4 lo. 50 cars.
C. H. Pratt, *Supt*.........New Haven, Conn.
J. E. Martin, *Supt.& Pur. A*.Litchfield,Conn.
A. J. Broughel. *M.M.&M.C.B*.Hawleyville. Ct.
Sherman, Shreveport & Southern Ry.
4—8½ 153 m. 8 lo. 141 cars.
F. W. Fratt, *G. M*.............Greenville, Tex.
E. M. Alvord, *G. S. & P. A* .Greenville, Tex.
Jas. Long, *M. M. & M. C. B*.Greenville, Tex.
Silver Lake Ry. Co. 4-8½ g. 7 m. 1 lo. 520 cars.
C. A. Carmichael, *Supt*..........Perry, N. Y.
John A. Dalziel, *Pur. Agt*...Rochester, N.Y.
Silver Springs, Ocala & Gulf R. R. (*See Plant System.*)
Sioux City, O'Neill & Western Ry.
4-8½ g. 129 m. 6 lo. 355 cars.
F. C. Hills, *Receiver & P. A* ..Sioux City, Ia.
T. Roope, *M. M. & M. C. B*... Sioux City, Ia.
Sioux City & Northern R. R.
4-8½ g. 97 m. 12 l. 477 cars.
W. Hough, S. J. Beals, } *Receivers*.
G W. Oakley, *Pur. Agt*.......Sioux City, a
T. Roope, *M. M*....... ....Sioux City, Ia.
Sioux City & Pacific and 4-8½ g. 107 m. 11 lo. 370 c.
Fremont, Elkhorn & Mo. Val. R. R.
3 and 4-8½ g. 1,300m. 93 l. 4,052 cars
H. G. Burt, *Gen. Man*......... ..Omaha Neb.
C. H. Haywood, *Pur. Agt*.. ......Chicago, Ill.
S. A. Teal, *M. M*....... .. .Missouri Valley, Ia.
W. H. Ramseyer, *M. C. B*..Missouri Valley. Ia
Skaneateles R. R. 4-8½ g. 5 m. 2 lo. 5 cars.
J.McNamara, *Man., Supt. & Pur. Agt*. Skaneateles, N. Y.
M. Fennell, *M. M. & M.C. B*.Skaneateles, N. Y.
Somerset Ry. 4-8½ g. 42 m. 6 lo. 52 cars
W.M.Ayer,*Supt & Pur. Agt*......Oakland. Me
C. Crowell, *M. M*.......... ......Oakland, Me
S. P. Mosher, *M.C.B*.... .... .Oakland. Me
Sonora Ry. (*See A., T, & Santa Fe R R*)
South Atlantic & Ohio R. R. 4-9 g. 71 m. 10 l. 321 c.
John. C. Haskell, *Pres. & Rec*....Bristol, Va.
John R. King, *M. M. & M. C. B*.....Bristol, Va.
South Carolina & Georgia R. R.
4-9 . 270 m. 45 lo. 1,464 cars.
E. S Bowers, *Gen. Man*.......Charleston,S.C.
Ed. Parsons, *Pur. Agt*.......Charleston, S. C.
James Meehan,*M.M.&M.C.B*.Charleston,S.C
Southern California Ry. 4-8½ g. 490 m. 25 lo. 216 c.
K.H. Wade *Gen. Man.&P.A*.Los Angeles, Cal.
G.W. Prescott, *Supt. M. & Car Dept*., San Bernardino. Cal.
Southern Pacific Company and proprietary lines:
4-8½ and 3 ft. g. 144.20 m. 3 ft., 6,496 80 4-8½ 962 lo. 25,051 cars.
A. N. Towne, *Gen. Man*. Pacific System, San Francisco. Cal.
R. P. Schwerin, *Pur. Agt*....San Francisco, Cal.
J. Kruttschnitt, *Gen. Man*....Atlantic System,
Henry J.Small,*Supt.M.P.& M*.Sacramento,Cal.
Benj. Welch, *M. C. B*..........Sacramento. Cal.
Pacific System
Western Div.:
A. D. Wilder, *Supt*....... Oakland Pier, Cal.
Wm. McKenzie, *M. M*. ....Oakland, Cal
W. B. Ludlow, *M. C. B*.... ....Oakland, Cal.
R. E. French, *M. M*. ... .Bakersfield, Cal.
Sacram'nto Div.: J.B.Wright,*Supt*.Sa'mento,Cal.
T. W. Heintzleman, *M. M*..Sacramento,Cal.
Truckee Div.:
J. Alger, *Supt*..............Wadsworth, Nev.
Geo. H. Hunt, *M. M* ...... Wadsworth, Nev.
Salt Lake Div. S. W. Knapp. *Supt*.Ogden, Utah.
E. M. Luckett, *Act. M. M*. .Terrace, Utah.
Coast Div.:
J. L. Frazer, *Supt*....... San Francisco,Cal.
P. Sheedy, *M.M.& M.C.B*.San Francisco, Cal.
Stockton Div:
W. W. Prugh, *Supt*...... ....Lodi, Cal.
M. J. Crosby, *M. M*.......Stockton Wharf, Cal.
Yuma Div. :
J. A. Muir, *Supt*....... .. .Los Angeles, Cal.
Geo. Gregg, *M. M*.. ....Los Angeles, Cal.

Tucson Div.:
J. S. Noble, *Supt*.... ....Tucson, Ariz
R. W. Gray, *M. M*......... .....Tucson, Ariz
Shasta Div.: H. Cooley, *Supt*....Dunsmuir, Cal.
A. D. Kilborn,. *M.M*..........Dunsmuir, Cal.
Oregon and Sacramento Div.:
L. R. Fields, *Supt*..... ....Portland, Ore.
T. W. Younger, *M. M*.........Portland, Ore.
Southern Ry. Co.
4 ft. 9 in. g. and 3 ft. 4,393 m. 384 lo. 10,386 c.
W. H. Green, *Gen. Man* ..Washington, D. C.
J. P. Minetree, *Pur. Agt*...Washington, D. C.
R. D. Wade, *Supt. M.P*......Washington, D.C.
W.N.Thomas,*Asst.Supt.M.P*.Knoxville,Tenn.
Richmond & Danville Div.:
J. S. B. Thompson, *Supt*.....Richmond, Va.
W. H. Owens, *M.M*..... . Manchester Va.
Virginia Md. Div.:
J. S. B. Thompson, *Supt* ....Richmond, Va.
C. F. Thomas, *M. M*........Alexandria, Va.
Atlanta & Charlotte Div.:
J. A. Dodson, *Supt*........ . . Atlanta, Ga
W. A. Walden, *M. M*..........Atlanta, Ga.
Geo. Pac. Div.:
J. N. Ross, *Act. Supt* .....Birmingham,Ala.
W. L. Tracey, *M. M*.. ....Birmingham, Ala.
Columbus & Greenville Div.:
W. B. Ryder, *Gen. Supt* ... ..Columbia, S. C.
J. H. Green, *M. M*... ....Columbia, S. C.
Wn. No. Carolina Div.:
E. Berkeley, *Supt*..........Greensboro, N. C.
J. C. Holt, *M. M*... ....Burlington, N. C.
C. W. Lee. *M. M*........... ....Salisbury N. C.
Southwestern Ry. 3 g. 35 m. 4 lo. 55 cars.
L. E. Barker,*S.&P.A*.GreenCoveSprings,Fla.
J. F. Lowe, *M. M*..Green Cove Springs, Fla.
South Florida R. R. (*See Plant System.*)
South Jersey R. R. 4-8½ g. 67 m. 8 lo. 38 cars.
Francis I. Gowen,*Receiver*..Cape May,N.J.
Henry Wood *Man*.......... Cape May, N. J.
C. T. Kensil, *P. A*... .... Philadelphia, Pa
Spokane Falls & Northern R.R. Co
-8½ g. 191 m. 8 lo. 304 cars.
D. C. Corbin, *Gen. Man*...... Spokane, Wash.
O. D. Mott, *Pur. Agt* ....Spokane, Wash.
C. H. Prescott, *M. M. & C. B*..Spokane, Wash.
Staten Island Rapid Transit R.R.
4-8½ g. 30 m. 18 l. 103 cars.
Frank S. Gannon, *Gen. Supt*... ....New York.
W. H. Lewis, *Pur. Agt*.... .... New York.
Thos. Tyrrell, *M. M*... .... Clifton, S. I.
Stewartstown R.R. 4-8¾ g.7 m. 1 lo. 3 cars.
M. W. Bahn, *Gen. Man*....Stewartstown, Pa.
W. H. Fulton, *G.S.&P.A*. .Stewartstown, Pa.
J. B. Kennedy, *M. M*. ...... Stewartstown, Pa.
Stony Clove & Catskill Mountain R. R. (*See Ulster & Delaware*).
3 g. 14 m. 2 lo. 19 cars.
Stuttgart & Arkansas River Ry.
4-8½ g. 35 m. 2 lo. 4 cars.
A. V. Stafford, *Rec*.............Stuttgart, Ark.
Suffolk & Carolina Ry. 3-6 g. 40 m. 4 lo. 107 cars.
J. H. Macleary.*G.Man.,Pur. A.,Supt.&M.M.* Suffolk, Va.
Sumter Valley Ry.
3 g. 25 m. 4 lo. 70 cars.
David Eccles, *Gen. Man*......Baker City. Ore.
J. A. West. *Supt. & P. A*.... Baker City, Ore.
F. W. Shurtliff,*M.M.&M.C. B*.Baker City,Ore.
Syracuse, Geneva & Corning. (*See Fall B. Coal Co*).

T

Tennessee Midland Ry.: 4-8½ g. 135 m. 7 lo. 187 c. (*See Paducah, Tenn. & Ala.*)
Terminal Ry. Association of St. Louis: 4-8½g.
Joseph Ramsey, *Gen. Man*.....St. Louis. Mo.
H. M. Smith, *M. M*............. St. Louis, Mo.
J. E. Williams, *P. A*...... .... St. Louis, Mo.
Terre Haute & Indianapolis R. R.
Vandalia Line.
4-9 g. 684 m.137 lo. 6,197 cars.
J. G. Williams, *Gen. Man*..Terre Haute,Ind.
C. R Peddle, *Pur. Agt*.......Terre Haute, Ind.
Geo. H.Prescott,*S.M.P.& M*...Terre Haute,Ind.
Wm. R. McKeen, Jr.,*M.C.B*. Terre Haute,Ind.
Texarkana & Ft. Smith Ry.:
4-8½ g. 36 m. 4 lo. 40 c.
W. S. Taylor, *Pres. &P.A*...Kansas City, Mo.
J. T. Romack, *M. C. B*........Texarkana, Tex.
Texas Central Ry. 4-8½ g. 187 m. 10 l. 237 cars
C. Hamilton, *Gen. M. & P. A*.....Waco, Tex.
F. H. Dehn, *M. M*.... .. Walnut Springs, Tex
P. T. Mooney, *M. C. B*..Walnut Springs, Tex.
Texas Midland Ry.
4-8¼ g. 75 m. 4 lo. 120 c.
E. H. R. Green, *G.M.&Pur. A*.. Terrell, Tex.
B. Hanson, *M. M. & M. C. B*....Terrell, Tex.
Texas & N. Orleans R. R. (*See So. Pac.*)
Texas & Pacific R.R. 4-8½ g. 1,499 m. 193 l. 4,495c.
L. S. Thorne, *Gen. Man*.... .... .Dallas, Tex.
A. Gould, *Pur. Agt*... ....St. Louis, Mo
J. W. Addis, *S. M. P*.. ....Marshall, Tex.
W. D. Minton, *M. C. B*.. ....Marshall, Tex.
N. Orleans Div.:
C. M. Babcock, *M. M* ....Gouldsboro, La.
Rio Grande Div.:
J. Patton, *M. M*..............Big Springs. Tex
Texas, Sabine Valley & Northwestern Ry.
4-8½ g. 40 m. 3 lo. 28 cars.
R. J. Evans, *G. M.,G.S. & P.A*.Longview. Tex.
T. M. Berry, *M. M.& M. C. B*...Longview, Tex.
Texas Trunk R. R. 4-8½ g. 51 m. 2 lo. 64 cars.
G. T. Atkins, *Rec*.................Dallas, Tex.
C. H. Burns, *M. M* .... Houston, Tex.
Jas McGee, *M. C. B*............Houston, Tex.
Tionesta Valley R. R 3 g. 43 m. 3 l. 184c.
James Horton, *Gen.Man* ...... Sheffield, Pa.
Jerry Crary, *G. S., P. A., M. M. & M. C. B.*, Sheffield, Pa.
Toledo, Ann Ar. & No. Mich. Ry. (*See Ohio Central Lines.*)
Toledo & Ohio Central Ry. (*See Ohio Cent. Lines.*
Toledo, Peoria & Western Ry.
4-9g. 248 m. 40 l. 925 c.
Ed. F. Leonard. *Gen. Man*..........Peoria, Ill.
E. N. Armstrong, *P. A*............Peoria. Ill.
B. Warren, *M. M. & M. C. B*. ......Peoria. Ill.
Toledo, St.Louis & Kan. City R. R.
4-8½ g. 451 m. 87 lo. 3,697 c.
S. R. Callaway, *Rec*.............New York. N.Y.
A. L. Mills, *Pur. Agt. & Supt*......Toledo, O
C. E. Walker, *Supt. M.P* .....Frankfort, Ind.
J. Tenfer, *M. C. B*...... .....Frankfort, Ind.
Tuckerton R. R. 4-9 g. 29 m. 3 lo. 23 car.
John C. Price, *S., P. A., M. M. & M. C. B.*, Tuckerton, N. J.

U

Ulster & Delaware R. R. 4-8½ g. 87 m. 17 lo.302 cars.
Jas. H. Jones, *Supt. & P. A*....Rondout, N. Y.
A. E. Benson, *M. M*......... ...Rondout, N. Y
John H. Decker, *M. C. B*..... ..Rondout, N. Y.
Union Pacific Ry. (8 Gen. Divs.)
4-8½ g. 7,343 m. / 3 g. 448m. } 1,057 lo. 27,038 cars.
E. Dickinson, *Gen. Man*...........Omaha, Neb.
J. W. Griffith, *Pur. Agt* .. ..Omaha, Neb.
J. H. McConnell, *Supt. M. P*......Omaha.Neb
Neb. Div.:
P. J. Nichols, *Gen. Supt*..... ....Omaha, Neb
J. H. Manning, *M.M*...............Omaha, Neb.
A. M. Collett, *Gen. Car For*......Omaha W.T.
Wyo. Div.
T. A. Davies, *M. M*. ....Laramie, Neb.
Utah Div.:
J. H. Young, *Supt*.. .....Salt Lake City, Utah.
D. Patterson, *M. M*....Salt Lake City, Utah.
Col. Div.: P. Tuohy, *Supt*..... .Denver, Col
J. P. Bay, *M. M*... ....—Denver, Col.
J. W. Blackburn, *For.Car Reps*.,Denver,Col.
Idaho Div.: E. E. Calvin, *Supt*.....Pocatello, Id.
J. F. Dunn, *M. M*.. ....Pocatello, Id.
Kan. Div.: J.O.Brinkerhoff, *Supt*.Kan. City, Mo.
F. Mertsheimer, *M.M*. ...Armstrong, Kan.
Pac. Div.: E. B. Gibbs, *M. M*.....Albino, Ore.
Union Tank Line Co. 6.000 cars.
C. A. Smith, *M. C. B*...........New York,N.Y
Utah Central Ry.
3 g. 63.6 m. 7 lo. 158 cars.
J. McGregor.*G.M.&P.A*.Salt Lake City.Utah.
J. G. Bywater, *M.M&M.C.B*.S. L. City,Utah.

V

Valley Ry. (Ohio) 4-8½ g. 76 m. 30 lo. 1,125 cars
N. Monsarrat, *Receiver*.....Cleveland, O.
J. T. Johnson, *Supt*.....Cleveland, Ohio.
Y. Anderson, *Pur. A*.....Cleveland, O.
Vermont Valley. (*See Boston & Maine.*)
Vicksburg & Meridian R.R. (*See Queen & Crescent.*)
Virginia & Truckee R. R. 4-8½ g. 52 m. 14 lo. 325 c.
Hume Yerington, *G. M. & P. A.* Carson City, Nev.
I. N. Fording, *M M*.. ..... Carson City, Nev.
C. Brulein, *M. C. B*.....Carson City, Nev.
Virginia Midland Ry. (*See Southern Ry. Co.*)

W

Wabash R.R. 4-8½ g. 2,049 m. 418 l. 13,875 c
Chas. M. Hays, *Gen. Man*..... .St. Louis, Mo.
J. B. Barnes, *Supt. M. P.* .... ..Springfield, Ill.
M. M. Martin, *Supt. C. D*.....Decatur, Ill.
H. H. Wellman, *Pur. Agt*.....St. Louis, Mo.
Wabash, Chester & Western R.R.
4-8½ g. 65 m. 4 l. 102 c.
C. B. Cole, *Gen. Man*..... .....Chester, Ill.
J. R. Hawkins, *Gen. Supt & P. Agt.* Chester, Ill.
Waco & Northwestern Ry.
4-8½ g. 54 m. 6 lo. 90 cars.
P. A. Gorman, *G. M. & P. A*.....Waco, Tex.
Wagner Palace Car Co.
W. S. Webb, *Pres*..... .....New York, N. Y.
J. D. Taylor, *Treas*.....New York, N. Y
T. A. Bissell, *Manager Buff. Wks*, Buffalo, N. Y.
Wallkill Valley. 4-8½ g. 38 m. 3 l. 17 c
J. D. Layng, *Gen. Man*..... New York, N.Y.
A. Bourn, *Pur. Agt*..... New York
Wm. Buchanan, *Supt. M. P*.....New York
J. M. Boon, *Asst. S. M. P*.. ...Frankfort, N.Y
Washington & Columbia River Ry. Co.
4-8½ g, 162 m. 7 lo. 67 cars.
W. D. Tyler, *Gen. Man. & Pur. Agt.*, Walla-Walla, Wash.
J. Winslow, *S. M. P*....Walla-Walla, Wash.
Washington Southern Ry. Co. 4-8½ g. 75 m. 3 l. 118 c.
J. R. McDonald, *G. M. & S*....Seattle, Wash
A. Johnson, *Pur. Agt*.....Shelton, Wash.
M. M. & M. C. B...Shelton, Wash.
Waynesburg & Washington R.R. 3g. 29 m. 4 l. 53 c
C. E. Bower, *Supt*..... .....Waynesburg, Pa
H. O. Hukill, *Purch. Agt*.....Pittsburgh, Pa
A. M. Kline, *M. M*.....Waynesburg, Pa
Waycross Air Line Ry. 4-8½ g. 35 m. 5 lo. 30 c.
L. Johnson, *G. M*..... ....Waycross, Ga.
F. M. Hawkins, *Pur. Agt* .... Waycross, Ga
John Welch, *M. M*..... .....Waycross, Ga,
Western & Atlantic R. R.
(*See Nashville, Chatt. & St. Louis Ry. Co.*)
Western Maryland R. R. 4-8½ g. 222 m. 50 lo. 856 c.
J. M. Hood, *Pr. & Gen. Man* ...Baltimore, Md
R. J. Adair, *Pur. Agt*.....Baltimore, Md
David Holtz, *Mast. of Mach*..Union Bridge, Md
D. E. Little, *M. C. B*..... Union Bridge, Md.
Balt. & Har'sb'g Div.: H. D. Scott, *Spt*..Hanover, Pa.
H. S. Reiley, *M. M*... .....Hanover Pa.
Western New York & Pennsylvania R.R.
4-8½ and 3 g .634 m. 149 l. 8,800 c.
S. G. De Coursey, *Receiver*.....Buffalo, N. Y.
Robert Bell, *Gen. Supt*.....Buffalo, N.Y.
J. H. Poole, *Pur Agt*.... .....Buffalo, N. Y.
Allen Vail, *Gen. M. M*.....Buffalo, N. Y.
Pitts. Div.: J. P. Heindell, *Supt*.....Oil City, Pa.
P. P. Foller, *M. M*..... .....Oil City, Pa.
Roch. Div.: J. W. Watson, *Supt*.....Olean, N. Y.
John Magee, *M. M*..... .....Olean, N. Y.
West Jersey R. R. (*See Penn. R. R.; (3) Div.*
West Shore R. R. (N. Y. C. & H. R. R. R. Lessee.
4-8½ g. 489 m. 220 lo. 8,118 c.
J. D. Layng, *Gen. Man*.....New York, N. Y.
A. Bourn, *Pur. Agt*..... ....New York, N. Y.
Wm. Buchanan, *Sup. M. P*....New York, N.Y
Jas. M. Boon, *Asst. S. M. P*....Frankfort, N.Y.
H.R. Div.: W. G. Wattson, *Supt*..Weehawken, N. J.
J. Howard, *M. M*..... New Durham, N. J.
Buff. Div.: C. H. Ketcham, *Supt*..Syracuse, N. Y.
P. E. Garrison, *M. M*..... E. Buffalo, N. Y.
W. Va. Cent. & Pittsb'gh Ry. 4-8½ g. 150 m. 29 lo. 1,806 c.
C. L. Bretz, *Gen. Man*.. .....Cumberland, Md.
E. W. S. Moore, *Pur. Agt* ....Cumberland, Md.
J. S. Turner, *Supt. M. P*.....Elkins, W. Va.
W. Va. & Pittsburgh R. R. 4-8½ g. 160 m. 18 lo. 537 c.
A. H. Kunst, *G. Man. & Pur. A*..Weston, W. Va.
S. A. Steele, *M. M*..... Weston, W. Va.
White & Black River Valley Ry. 4-8½ g. 64 m. 4 l. 87 c.
W. J. Thompson, *Gen. Man. & P. A*., Little Rock, Ark.
W. J. Redding, *M. M*.... .. ...Brinkley, Ark.
L. F. Hill, *M. C. B*..... .....Brinkley, Ark.
Wheeling & L. E. Ry. 4-8½ g 249 m. 70 lo. 5.103 c
A. G. Blair, *G. M*. .....Toledo, O
F. S. Deal, *P. A*.....Toledo, O.
W. H. Stark, *M. C. B*.....Toledo, O.
O. P. Dunbar, *M. M*..... Norwalk, O.
Wichita & Western Ry. (Operated by A. T. & S. F. Ry.)
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4-8½ g. 47 m, 14 lo. 30 cars.
G. L. Sands, *Man*..... ..... St. Louis, Mo.
C. L. Leslie, *Pur. Agt*..... ..St. Louis, Mo.
P. H. Johnson, *M. M. & M. C. B*. St. Louis, Mo.
Williamsport & North Br. R. R. 4-9 g. 46 m. 7 l. 11 c.
R. E. Eavenson, *Gen. Man*....Hughesville, Pa.
Geo. Woodley, *M. M*.....Hughesville, Pa.
Wilmington & No'n R. R. 4-8¾ g. 90 m. 28 lo. 463 c.
A. G. McCausland, *S. & Pur. A*. Wilmington, Del.
George Rommel, *M. M* ...Wilmington, Del.
Wilmington, Newbern & Norfolk Ry.
4-9 g. 88 m. 4 lo. 74 cars.
H. A. Whiting, *Gen. Man*. Wilmington, N. C.
A. J. Howell, Jr. *Pur. Agt*. Wilmington, N. C.
Geo. E. Branch, *M. M*.....Wilmington, N. C.
Windsor & Annapolis Ry. (*See Dominion Atl. Ry*)
Winifrede R. R. 4-9 g. 10 m. 3 lo. 209 cars.
R. B. Cassady, *Gen. Supt*....Winifrede, W. Va.
H. W. Leitch, *Pur. Agt*....Winifrede, W. Va.
C. P. Spofford, *M. M*.....Winifrede, W. Va.
J. A. Bratt, *M. C. B* ... ..Winifrede, W. Va.
Winona and South Western.
4-8½ g. 117 m. 7 l. 291 cars.
J. J. Mahoney, *Supt. & P. A*..Winona, Minn.
John Mailar, *M. M. & M. C. B*. Winona, Minn.
Wisconsin Central Co.
4-8½ g. 938 m. 149 lo. 7,222 c.
H. F. Whitcomb, *Gen. Man*.. ....Chicago, Ill.
Sumner J. Collins, *Gen. Supt*.....Chicago, Ill.
J. A. Whaling, *Pur. Agt*.....Milwaukee, Wis.
Jas. McNaughton, *Supt. M. P*. Waukesha, Wis.
Wm. Cormack, *M. C. B* ..Waukesha, Wis.
Wood River Branch Ry. 4-8½ g. 6. m. 2 lo. 3 cars.
L. M. Barber, *S., P. A. & M. M*. Hope Val., R. I.
Wrightville & Tennille Ry. 4-8½ g. 35 m. 3 lo. 23 c.
G. W. Perkins, *Supt. & P. A*...Tennille, Ga.
W. H. Shepherd, *M. M. & M. C. B*. Tennille, Ga.

Y

Yarmouth & Annapolis. (*See Dominion Atl. Ry.*)
York Southern R. R.
3 ft. g. 41 m. 4 l. 7 pass. 100 frt. c.
G. M. Manifold, *Pur. Agt., Chf. E*..York, Pa.
G. M. Jacobs, *M. M*.....York, Pa.
Yougiogheny R. R. 4-8½ g. 10 m. 2 lo. 1,205 cars.
John F. Wolf, *Gen. Man. & Gen. Supt*. Irwin, Pa.
T. F. Wolf, *P. A*.....Irwin, Pa.
Jno. Bricker, *M. M*..... Irwin, Pa.
J. W. Heintzelman, *M. C. B*..... Irwin, Pa.

Z

Zanesville & Ohio River Ry. 4-8½ g. 75 m. 7 lo. 199
J. H. Sutor, *Rec. & Gen. Man*..Zanesville, O
J. Hope Sutor, *Pur. Agt*.....Zanesville, O
E. W. Jerome *M. M. & M. C. B*. Zanesville, O.

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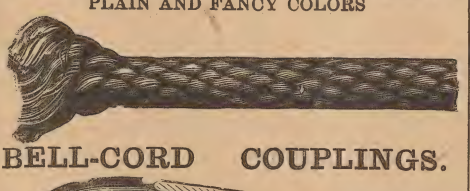

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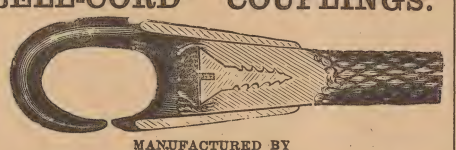

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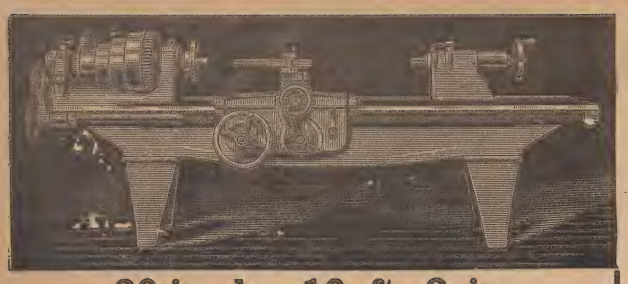

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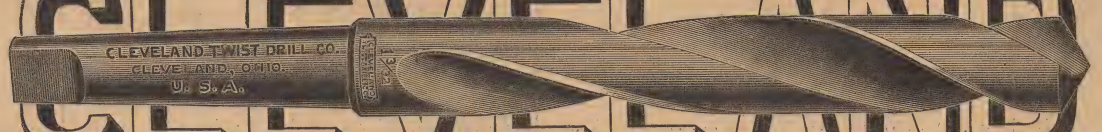

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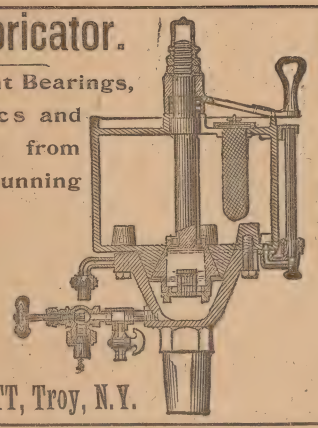

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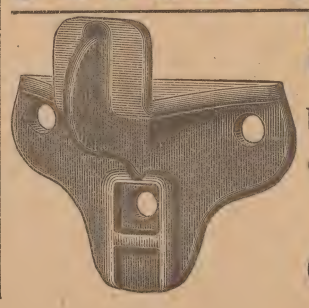

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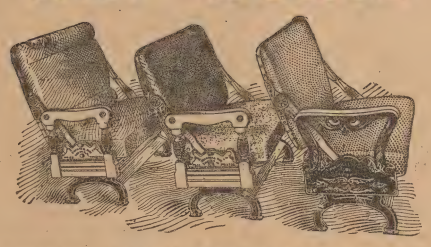

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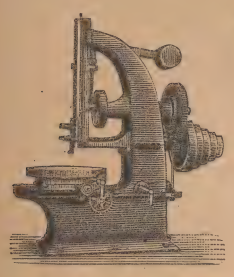

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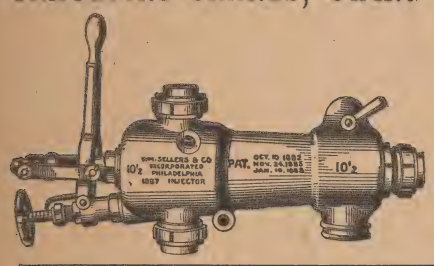

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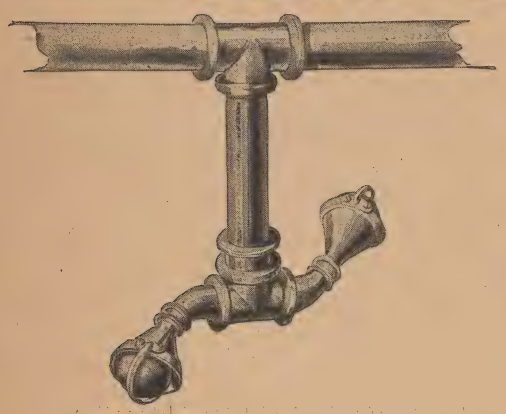

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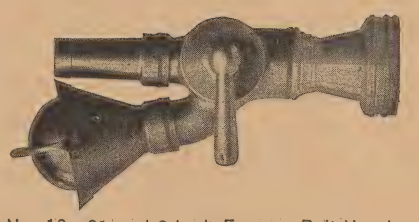

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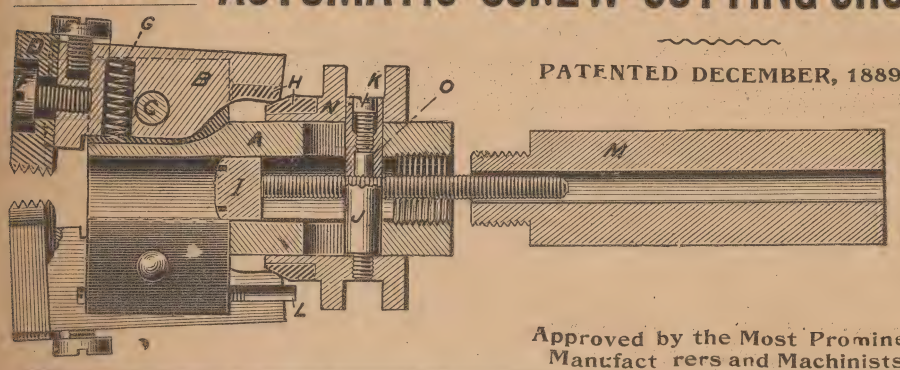

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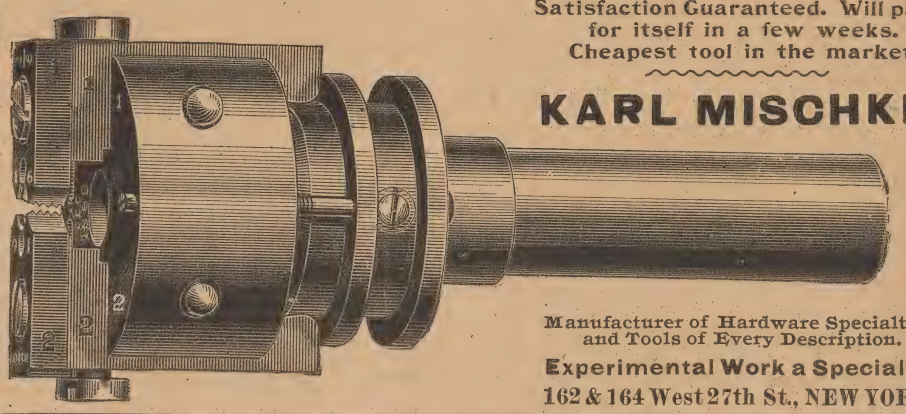

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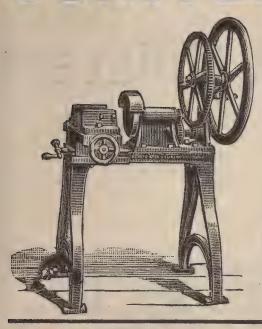

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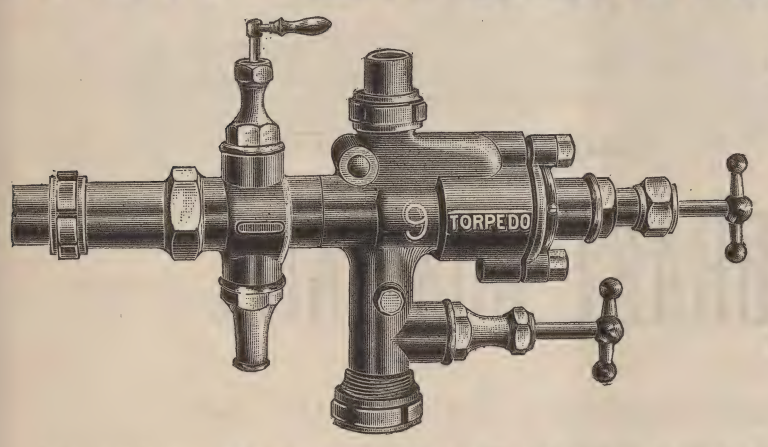

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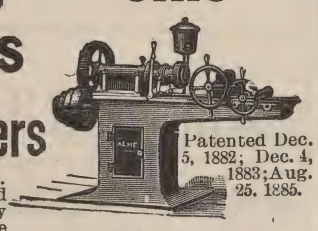

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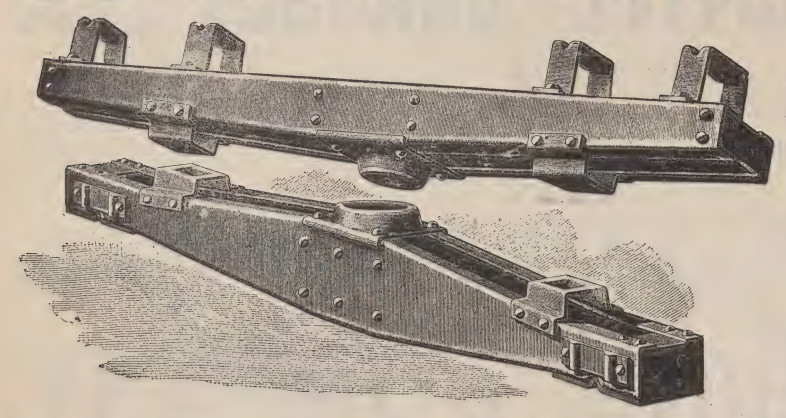

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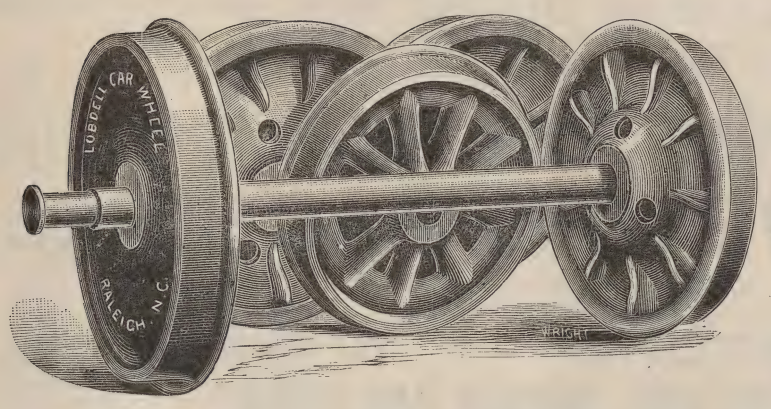

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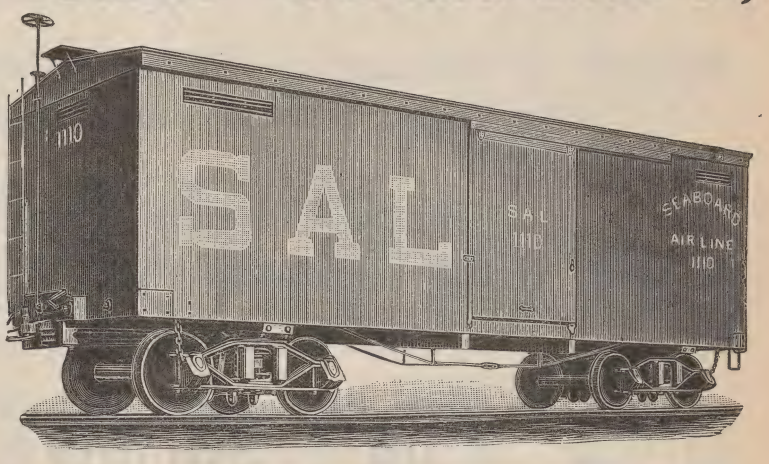

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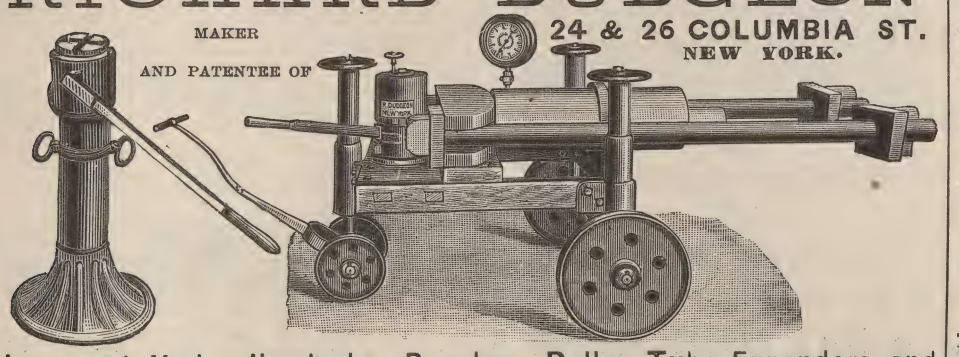

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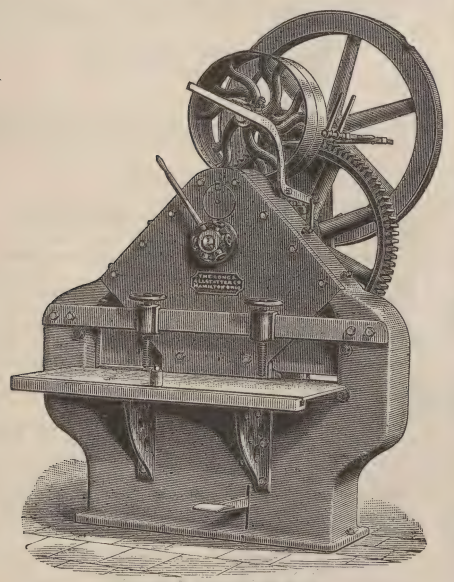

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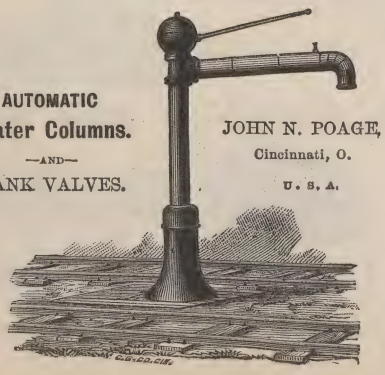

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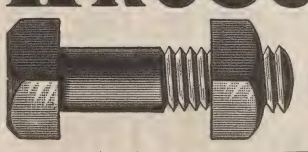

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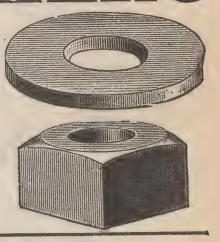

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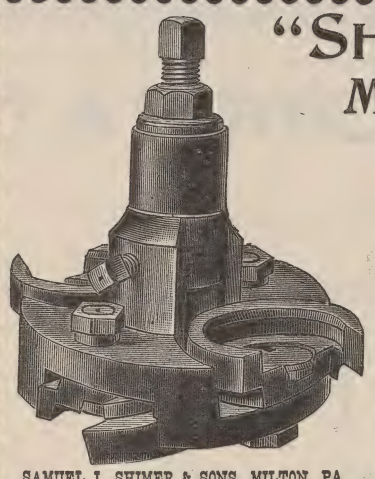

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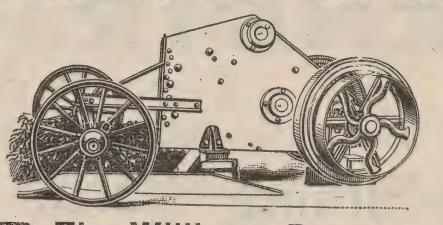

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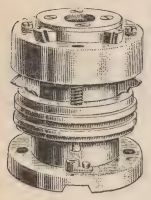

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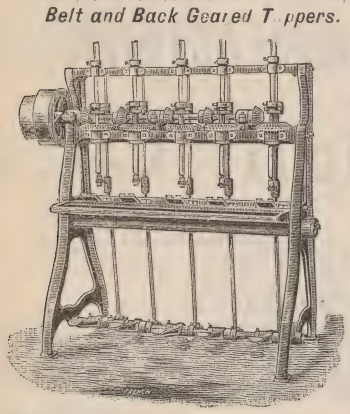

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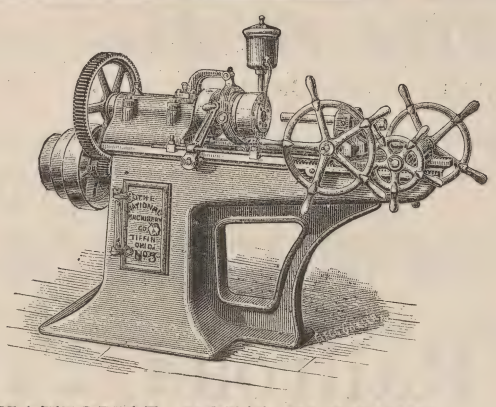

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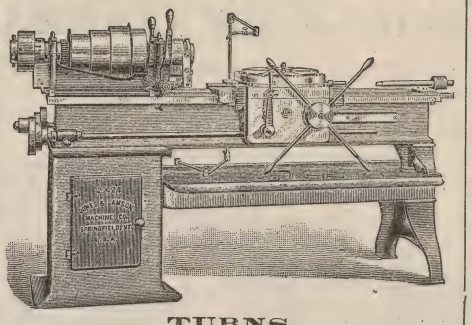

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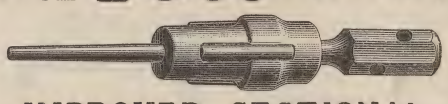

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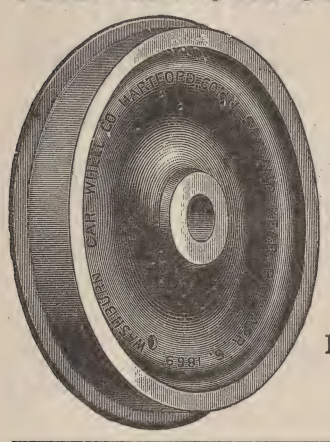

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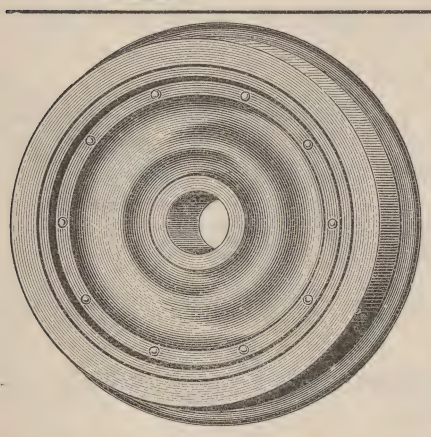

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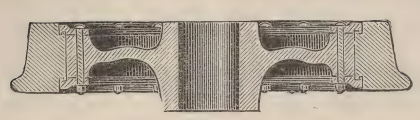

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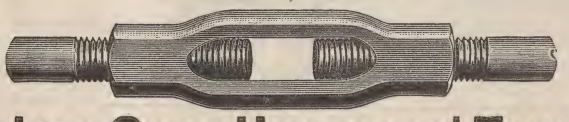

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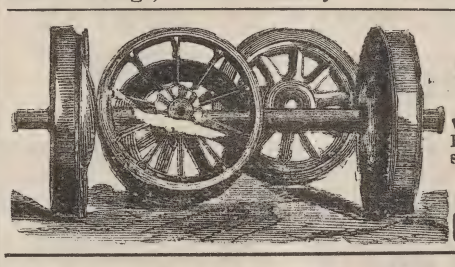

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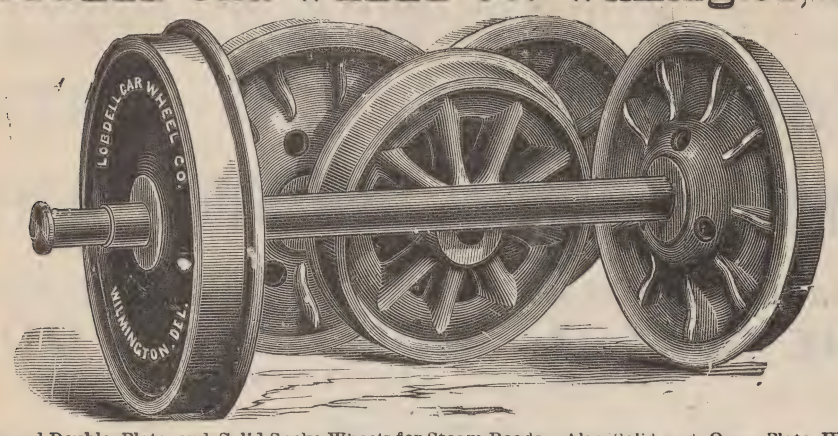

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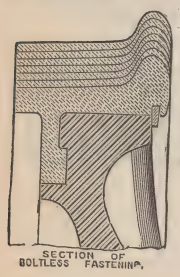

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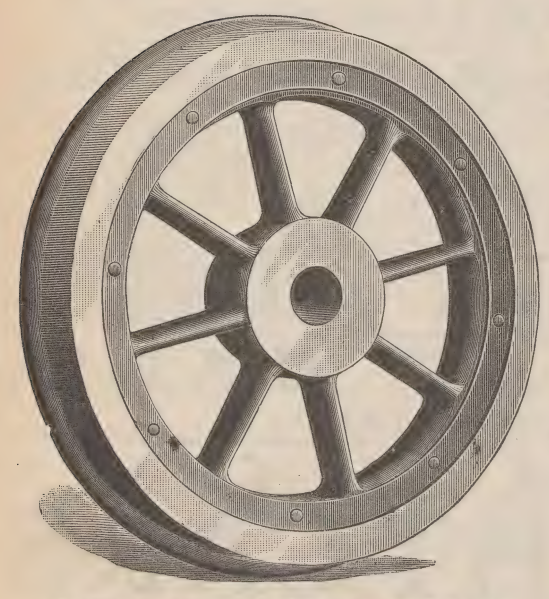

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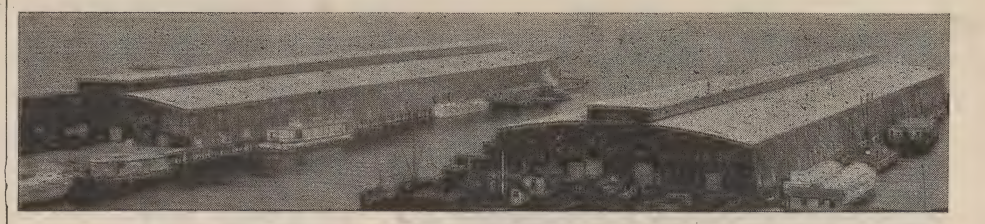

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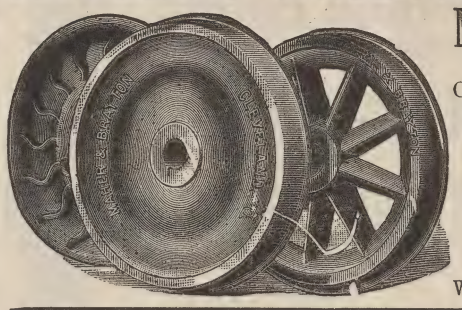

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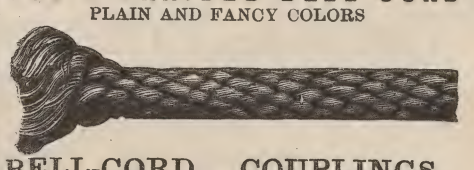

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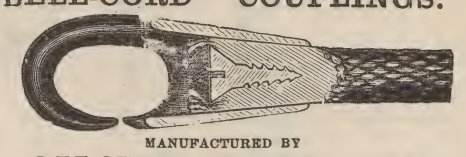

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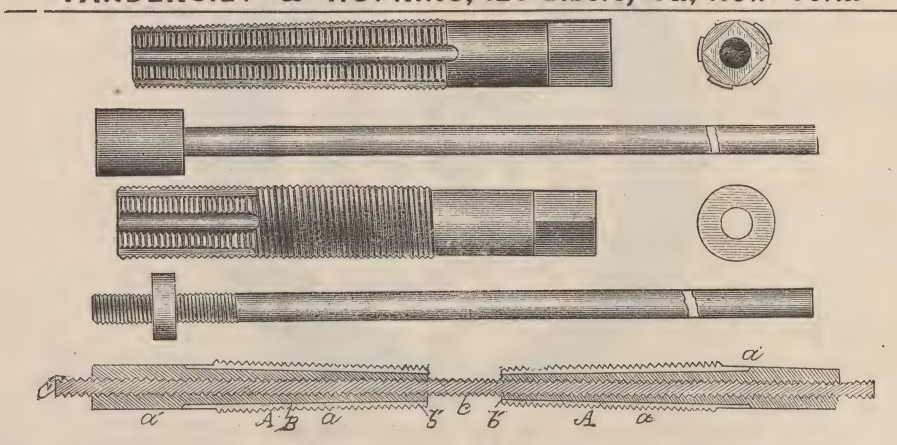

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RECORDS from six railroads during the past twelve months show that through the use of the LESLIE AUTOMATIC FIRE KINDLER the cost of kindling their fires has not varied more than the smallest fraction of a cent per fire, month after month, and that One Car Tank of Crude Oil will kindle more fires than 107 Carloads or 750 Cords of Wood.

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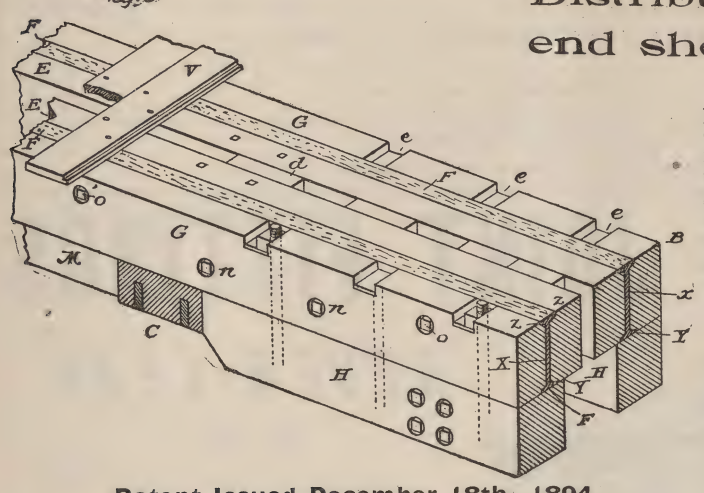
Fig. 6.



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(Blocks "d" can be omitted.) Auxiliary sill G. Short Oak Drafters attached thereto. Both easily replaced.

Distributes and better absorbs the constant end shocks to cars. . . . . .

Saves the body of car, especially from breaking down over body bolster, center sills from cracking, and stiffens the whole car structure and preserves the life of car. Elasticity of wood for bolts. Especially designed for easy repairs and save long sill replacement.

A GREAT SAVING.

Special I-beam, short bevel flanges, splendid for sandwich truck bolsters and horizontal support of wood.

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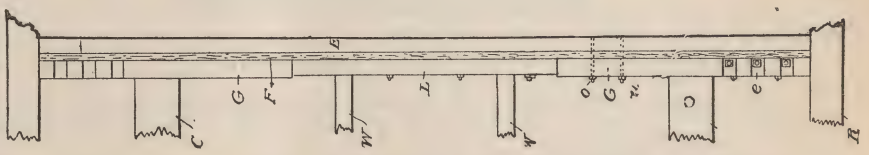
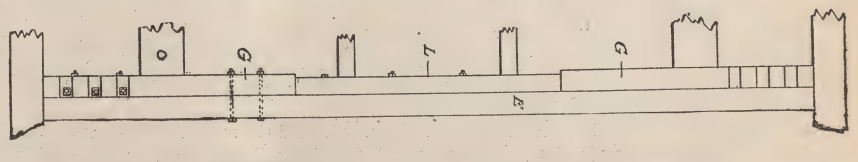


Equal to continuous draw rigging. Body bolsters can be set in nearer the middle of car, better for long car, thus better for curving and wearing of wheels.



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TO JUNE.	TOTAL CARS.
1883	11,422
1885	17,600
1887	26,100
1889	35,096
1891	45,300
1893	54,175
1895	64,800

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The superior jacket system in connection with the Baker heater.
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MANUFACTURED BY BOSTON BELTING CO. CAR HEATING HOSE

Guaranteed for 1 Year.

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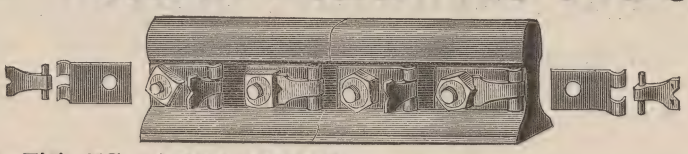


WHAT IT IS AND DOES

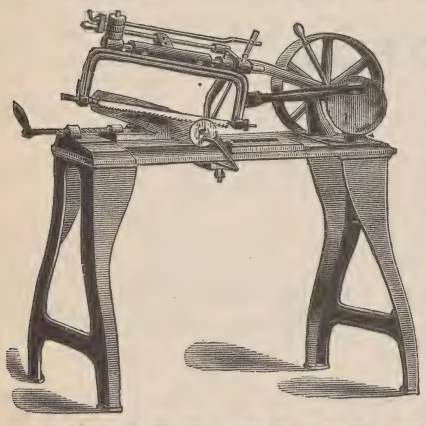
It is the only nut-lock ever invented.
It is most simple, most strong, most cheap.
It locks any nut of any shape, in any position.
It can be taken up with the rail at any time and replaced without injury as often as necessary.
It will outwear and outlast any rail.
It is automatic. It does not injure the rail.
It is a saving to angle bars and bolts.
It can be attached to any rail or bolt, so that no change of system needs to be made in order to use it.
It makes a perfect joint.

Each nut is locked without regard to any other nut in the structure.
It secures rigidity to the joints, as the nuts cannot move under any circumstance.
It does not wear or "gnaw" into the plate as most nut-locks do.
When plates have been cut into and worn by other locks, this Lock still can be used, as *as its large washer covers the defect*, thus giving a full bearing for the nut.
The bolts now used can be shortened considerably, as no extra length will be needed, as now, to retain the nut on the bolt when loose, since this Lock will hold the nut just where it is placed.

This Lock has been put to the hardest kind of test, and has fully sustained all claimed for it.

McDONALD NUT-LOCK COMPANY,
271 BROADWAY, NEW YORK CITY.

STAR POWER HACK SAW.



The use of Hack Saws for cutting metals has increased a thousand fold at least in the last ten years, or since the Star blades were first introduced. Before that time England furnished most that were used. Now the world's supply is made in this country. We handle nearly all that are made and know that the demand doubles every 28 months.

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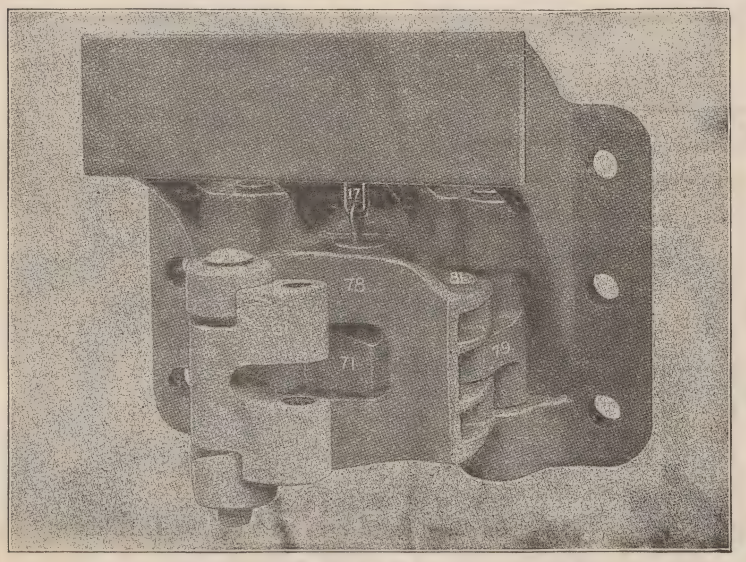

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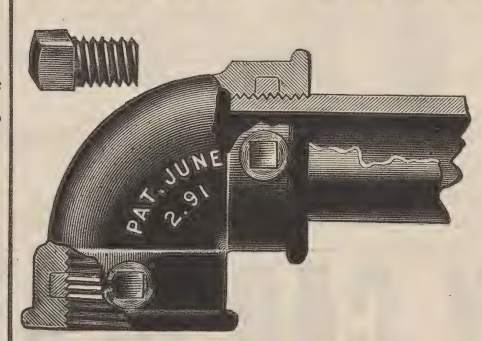

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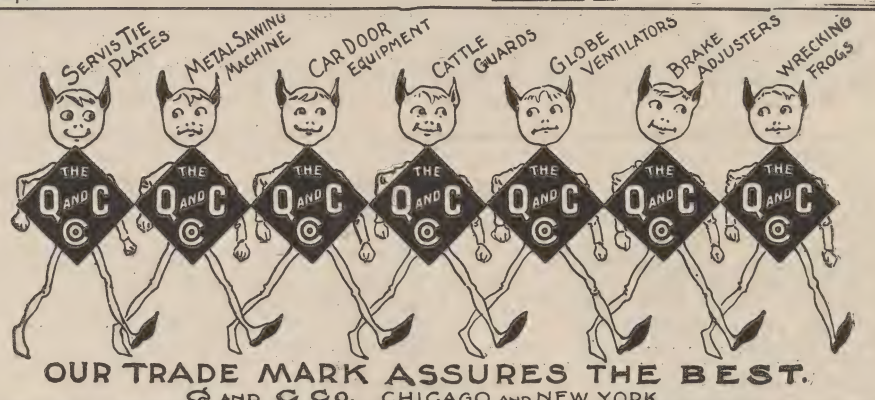

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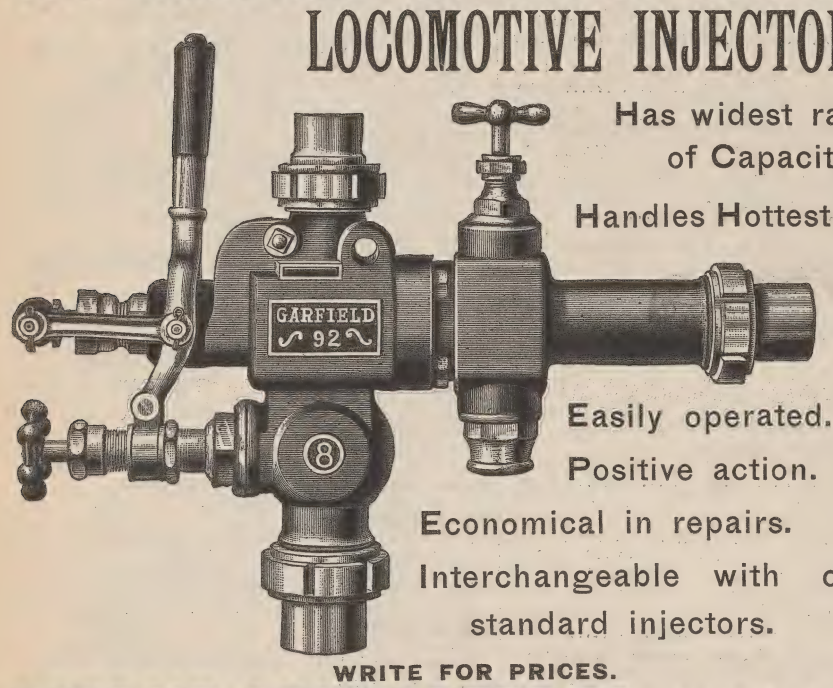

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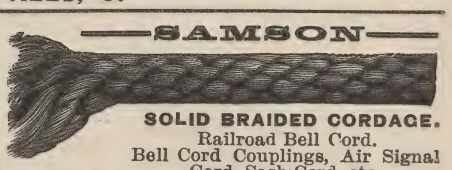
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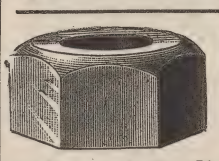
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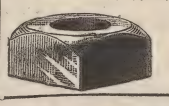
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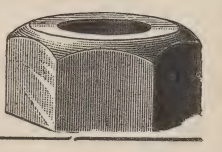

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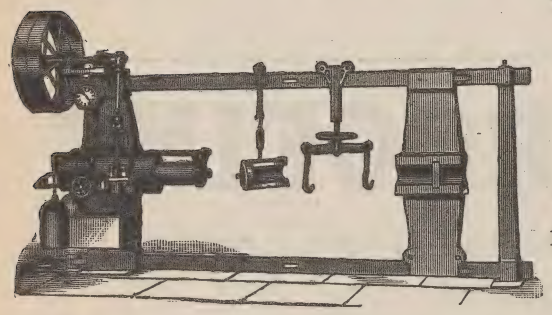
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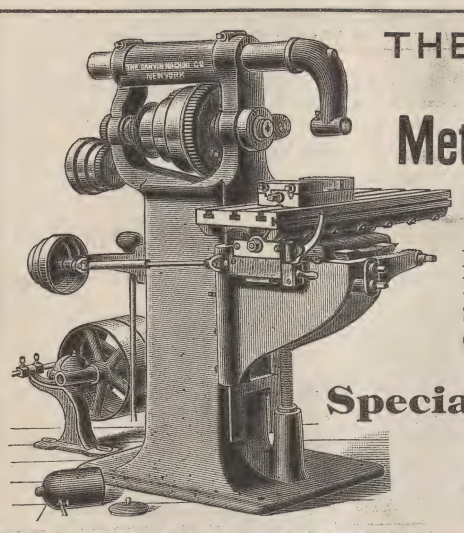

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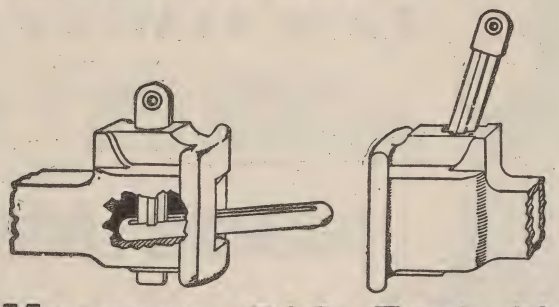

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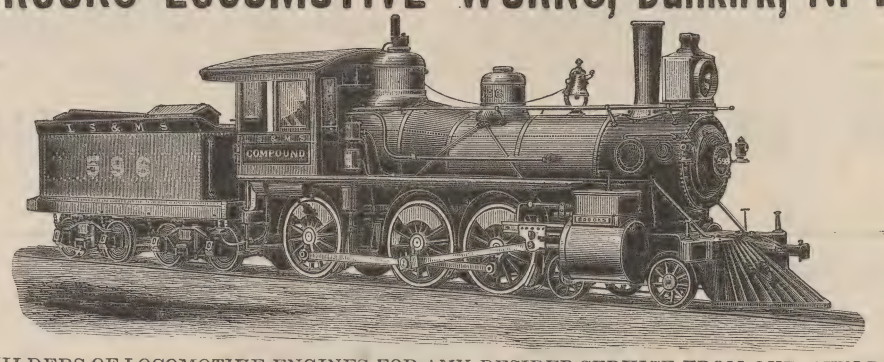

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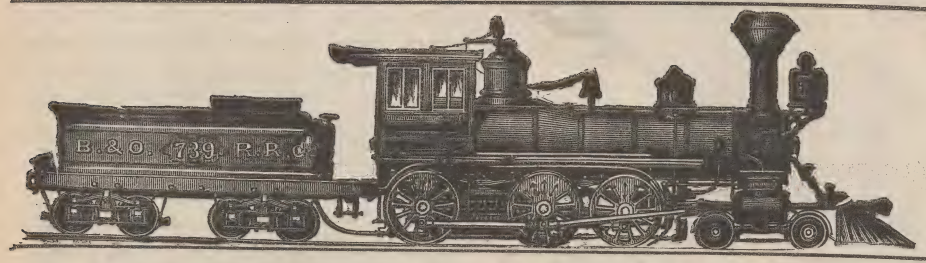

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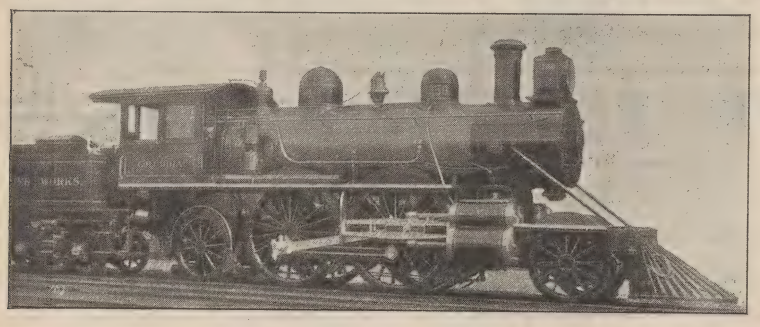

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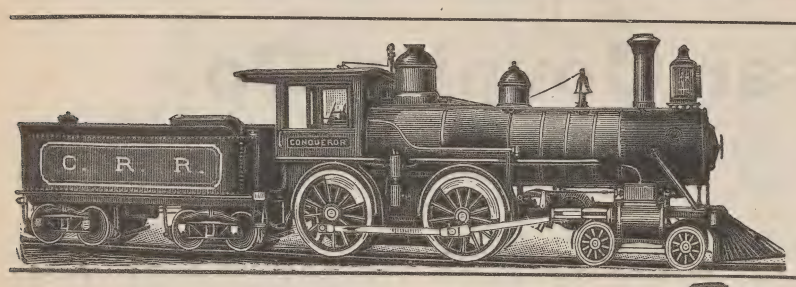

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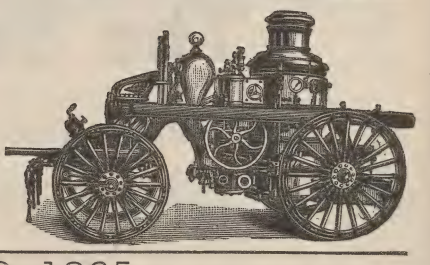

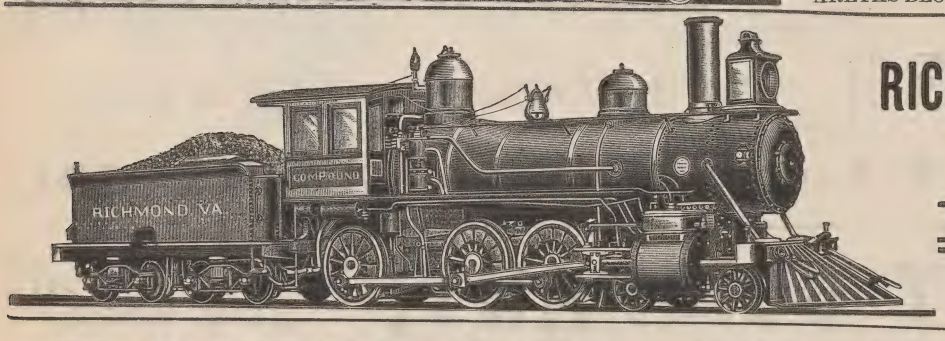

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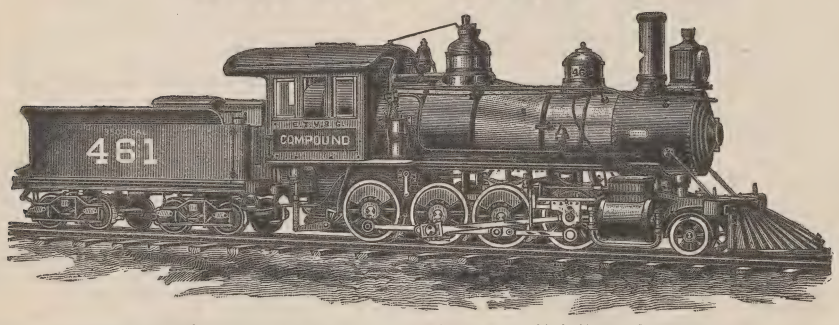

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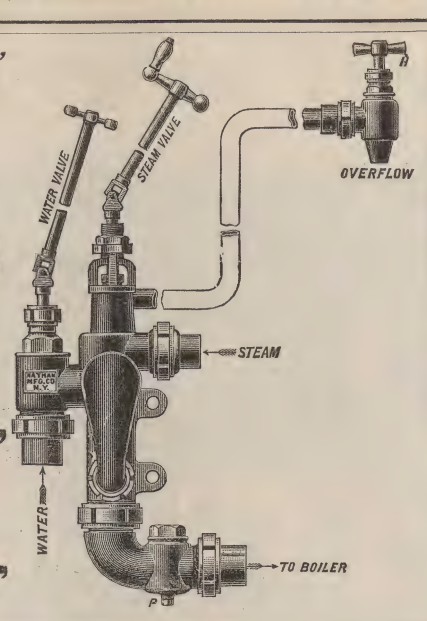

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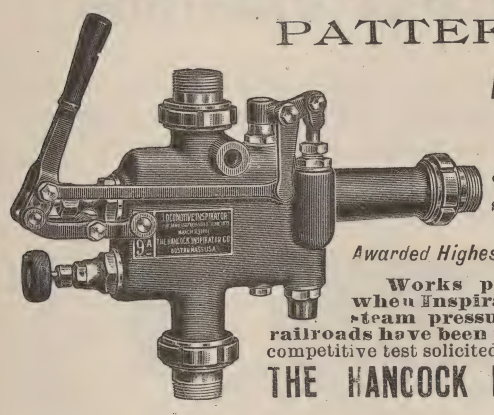

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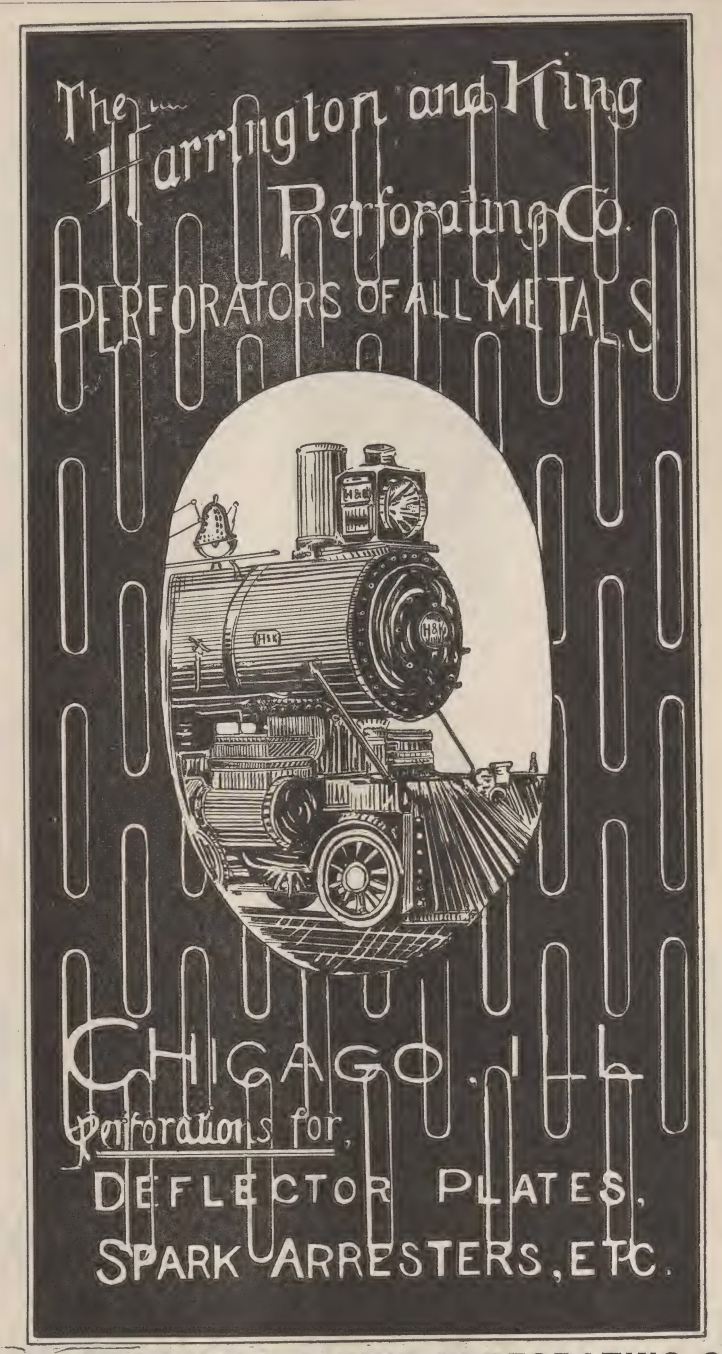

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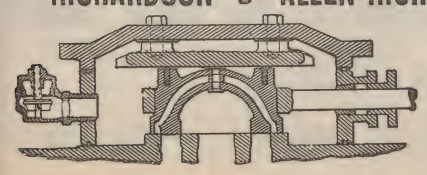

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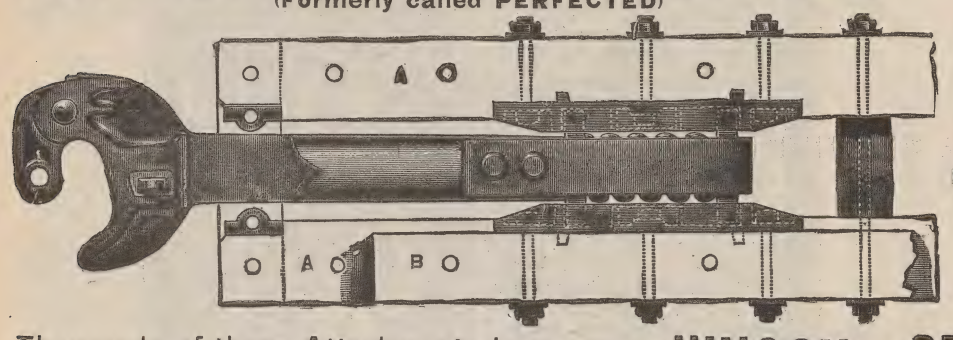

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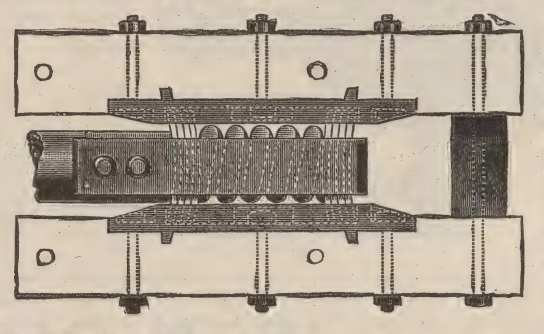

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1.00 p. m. "AFTERNOON EXPRESS,"	Buffet Parlor Cars and Day Coaches. Due at 7.30 p. m.
*3.00 p. m. "SHORE LINE EXPRESS,"	Parlor Cars, Parlor Smoking Car and Day Coaches. Dining Car between Boston and New London. Due at 9 00 p. m.
*5.00 p. m. "GILT EDGE EXPRESS,"	Due at 11.00 p. m Daily. Parlor Cars, Parlor Smoking Car and Day Coaches. Dining Car between Boston and New London.
*12.00 O'CLOCK "MIDNIGHT EXPRESS,"	Due at 7.00 a. m. Daily. Compartment Sleeping Cars and Day Coaches. Open for occupation at 9.15 p. m.

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JANUARY 1, 1895.

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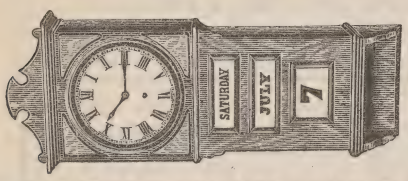

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of the Railroads of the United States and Canada. showing the gage, length of road, number of locomotives and number of cars; and giving the names and titles of their principal officors in charge of the operating, purchasing and rolling stock departments.

A

Addison & Penn'a Ry. 4-8½ g. 46 m. 4 lo. 30 c.
F. M. Baker, *G. Supt*............Addison, N.Y.
T. Langstine, *M. M*.......... ..Addison, N.Y.
Adirondack & St. Lawrence. (*See N. Y. Central.*)
Arizona & New Mexico Ry. 3 g. 71 m. 3 lo. 60 c.
James Colquhoun, *Pres*..........Clifton, Ariz.
J. G. Hopkins, *Sec. & Treas*......Clifton, Ariz.
Alabama Midland Ry. (*See Plant System.*)
Alberta Ry. & Coal Co. and Great Falls & Canada Ry. Co. 3 g. 67 m. 18 lo. 250 cars.
E. T. Galt, *Pres*.........Lethbridge, Alberta.
W. D. Barclay, *Man. & Pur. Agt.*, Lethbridge, Alberta.
T. McNabb, *M. M. & M. C. B.* Lethbridge, Alberta.
Albemarle&Pantego RR. (*See Norfolk&Southern.*)
Albemarle & Raleigh R.R. (*See Atlantic Coast Line*)
Allegheny & Kinzua R. R. 4-8½ g. 42 m. 2 lo. 45 c.
A. D. Scott, *Receiver* .. ..Buffalo, N. Y.
M. D. Murray, *G. S., Pur. Agt., M.M.&M.C.B.* Bradford, Pa.
Allegheny Valley Ry. Co. 4-9g. 259m. 80 lo. 2,997 c.
W. H. Barnes, *Pres*.... ......Philadelphia, Pa.
D. McCargo, *Gen. Supt*. .. ... Pittsburgh, Pa.
H. D. Mason, *Pur. Agt*.........Pittsburgh, Pa.
John C. Glass, *M. M*..............Verona, Pa.
John Cowan, *M. C. B*.............Verona, Pa.
Alliance & Northern. 48½ g. 25. m. 2 lo. 75 cars.
E. E. Scranton, *G. M. & P. A*..... Alliance, O.
Annapolis, Wash & Balt. R. R.
4-8½ g. 24 m. 3 lo. 11 c.
John W. Brown, *Pres.& Man.* Baltimore, Md
John L. Beall, *M. M.& M. C. B.*.Annapolis, Md.
Arkansas Midland R. R. 4-8½ g. 74 m. 7 lo. 126 cars.
J. J. Horner, *V.-P.& Gen. Man*....Helena, Ark.
J. B. Johnson, *Supt. & Pur. Agt*..Helena, Ark.
R. Allen, *M. M*..................Helena, Ark.
John A. Greenhoe, *M. C. B*......Helena, Ark.
Ashland Coal & Iron Ry. Co. 4-8½ g. 22 m. 8 lo. 433 c.
Douglas Putnam, Jr., *Gen. Man*..Ashland, Ky.
W. H. Apple, *M. M*............ Ashland, Ky.
Robt. Peebles, *Pur. Agt*.........Ashland, Ky.
Thos Ryan, *M. C. B* . . . . . .Ashland, Ky.
Ashtabula & Pittsburgh Ry. (*See Penna. Co.*)
Atchison, Topeka & Santa Fé R. R.
4-8½ g. 5,059 m. 885 lo 637 pass. & 29, 804 ft. c.
Aldace F. Walker, Chicago, Ill. }
J. J. McCook, New York, N. Y. } *Receivers*.
J. C. Wilson, Topeka, Kan. }
J. J. Frey, *G. M*..................Topeka, Kan.
Western Grand Div.:
W. G. Nevin, *Gen. Pur. Agt*......Chicago, Ill
John Player, *Supt. Machinery*...Topeka, Kan.
J. Hodge, *M.C. B*..... .... .Topeka, Kan
Atlantic & Pacific Div.: Separate management.
T. R. Gabel, *Gen. Supt*... Albuquerque N. M.
R. English., *M.M*..........Albuquerque, N. M.
Chicago Div.:
C. F. Rosseguie, *Supt* ....Chicago, Ill.
James Collinson, *M. M*......Fort Madison, Ia
Colorado, Midland Div.:
Eastern Div.: C. T. McLellan ....Topeka, Kan.
Geo. W. Smith, *M. M*.........Topeka, Kan.
W. H. Traver, *Asst. M. M*..Argentine, Kan.
Gulf, Colorado & Santa Fe Ry.
4-8½ g. 1,058 m. 83 lo. 3,396 c.
B. F. Yoakum, *V.-P. & G. M*..Galveston, Tex.
Geo. A. Hancock, *Supt. Mach.* Galveston, Tex.
J. W. Dickenson, *Div. Supt*. ..Temple, Tex.
J. W. Kelly, *Div. M. M*.... .. Temple, Tex.
A. J. Davidson, *Div. Supt*...Ft. Worth, Tex.
L. H. Waugh, *Div M. M*.... Cleburne, Tex
Mid. Div.: A. Turner, *Supt*........Newton, Kan.
Thos. Paxton, *M. M*.........Nickerson, Kan.
W. Div.:
J. Conroe, *M. M*.... ....La Junta, Col.
New Mex. Div.: Chas. Dyer, *Supt.* Las Vegas, N.M.
M. M..........Raton, N. M.
Rio Gr. Div.:
C. M. Taylor, *M. M*......San Marcial, N. M.
Southern California Ry.
4-8½ g. 490 m. 25 lo. 216 c.
K. H. Wade, *Gen. Man*...Los Angeles, Cal.
G. W. Prescott, *Supt. M. & Car Dept.*, San Bernardino, Cal.
So. Kan. Div.:
J. L. Barnes, *Supt*..............Chanute, Kan
Alva Mitchell, *M. M* . ...Ottawa, Kan
St. Louis & San Francisco Ry.
4-8½ g. 1,441 m. 195 lo. 5,929 c.
H. L. Morrill *2d V.-P. & G. M*..St. Louis, Mo.
E. T. Smith, *Pur. Agent* ....St. Louis, Mo.
J.R.Groves, *Supt.R.S.& C.B.* Springfield, Mo.
Atlanta & Florida Ry. 4-9 g. 105 m. 5 lo. 97 c.
W. B. Thomas *Rec. and G. Man.* Atlanta, Ga.
W. B. Thomas, *Pur. Agt*.. ......Atlanta, Ga.
Wm. Spencer, *M. M. & M.C.B*.. Atlanta, Ga.
Atlantic City R. R. (*See P. & R. R. R.*)
Atlantic Coast Line: Composed of the Richmond & Petersburg; Norfolk & Carolina; Petersburg, Wilmington & Weldon; Manchester and Augusta & Florence; Wilmington & Weldon and Wilmington, Columbia & Augusta; Central of So. Ca.; Wilmington, Chadbourn & Conway; Hartsville; Cheraw & Darlington. North Eastern.
4-9 g. 1,235 miles, 166 locomotives, 3,780 cars.
J. R. Kenly, *Gen. Man* .. Wilmington, N. C.
F. H. Fechtig, *Pur. Agt* .. Wilmington, N. C.
John Bisset, *M. M*...........Wilmington, N. C
Jno. O'Brien, *M.M*....... ...Manchester, Va.
J. H. Davis, *M.C. B*...... .Wilmington, N. C.
W. H. Day, *M. C. B*............Florence, S. C.
W. J. Acree, *M. C. B*..........Petersburg, Va.
Atlantic & Danville Ry.
3 and 4-8½ g. 285 m. 30 lo. 663 cars.
Gen. Man. . ....Norfolk, Va.
N. M. Reid, *M. M*.... ...... Portsmouth, Va.
B. Pierce, *M. C. B*............ ....Norfolk, Va.
Atlantic & Lake Superior Ry. Co.
4-8½ g. 81 m. 5 lo. 65 cars.
C. N. Armstrong, *Gen. Man*...Montreal, Que.
A. C. Wortele, *Pur. Agt*.......Montreal, Que.
Jos. Hunter, *M. M.& M.C B.* Metapedia, Que.
Atlantic & No. Carolina R.R. 4-9 g. 95 m. 7 l. 107 c.
S. L. Dill, *Supt*..................Newbern, N. C.
F. C. Roberts, *Pur. Agt*.......Newbern, N. C.
W. R. Waters, *M. M*............Newbern, N. C.
J. B. Taylor, *M. C B*.........Newbern, N. C.
Atlantic & Western R. R.
(*See J., St. A. & I. River Ry. Co.*)
Atlanta & West Point and Western Ry. of Alabama
4-9 g. 225 m. 33 lo. 608 cars.
Geo. C. Smith, *Pres. & Gen Man.* Atlanta, Ga.
Joseph Herrin, *Supt*.......Montgomery, Ala.
J. C. McCarty, *M. M*.......Montgomery, Ala.
Atlantic, Tenn.& Ohio R.R.... ....(*See Rich. & Dan.*
Augusta Southern. 3 ft. g. 84 m. 4 lo. 26 cars.
W. B. Thomas, *Gen. Man*........Augusta, Ga.
F. W. Reaney, *M. M. & M. C. B.* Augusta, Ga.
Au Sable & Northwestern. 3 g. 110 m. 16 l. 325 c
G. A. Loud, *Gen. Man*... Au Sable, Mich.
W. F. Loud, *Pur. Agt*.........Au Sable, Mich.
A. E. Walker, *M. M*..... ....McKinley, Mich.
John Law, Jr., *M. C. B*.....McKinley, Mich.
Austin & North Western R.R. 4-8½ g. 106 m. 8 l. 308c.
A. N. Leitnaker, *V. P. & G. Supt.* Austin, Tex.
Geo. Howes, *Pur. Agt*...... New York, N. Y.
Jas. McGee, *Supt. M. P. & M*..Houston, Tex.
C. H. Burns, *M. M*..............Houston, Tex.

B

Baltimore, Chesapeake & Atlantic R. R.
4-8½ g. 88 m. 8 lo. 96 c.
W. Thomson, *Gen. Man*...... Baltimore, Md.
A. J. Benjamin, *Supt. & P.A*..Salisbury, Md.
Fred Strattner, *Supt. M. P*.....Salisbury, Md.
Baltimore & Annapolis Short Line R. R.
26 m. 6 lo. 16 pass. 40 frt. c.
C. A. Coombs, *Gen. Man*.......Baltimore, Md.
J. P. Seward, *M. M*.............Annapolis, Md.
Baltimore & Delaware Bay R. R. Co.
4-8½ g. 49 m. 3 lo. 7 cars.
E. P. Stacey, *G. S. & Pur. A*...Clayton, Del.
Baltimore & Potomac R.R.........(*See Penna. R.R.*)
Baltimore & Lehigh R. R. Co. in Maryland.
3 ft. g. 44 m. 9 lo 200 cars.
W. A. Moore, *G. M. & Pur. A.* Baltimore, Md.
W. L. Guyton, *M. M*......... Baltimore, Md.
J. W. Allison, *M. C. B*... .... Baltimore, Md.
Baltimore & Ohio R. R.
4-8½ g. 2,065 m. 896 lo. 28,973 cars.
R. B. Campbell, *Gen. Man*....Baltimore, Md.
G. B. Hazlehurst, *G. Supt. M. P.* Baltimore, Md.
L. J. Buckley, *Pur. Agt*.......Baltimore, Md.
A. J. Cromwell, *Supt. M. P.*, Lines East of Ohio River, Baltimore, Md.
E. W. Grieves, *Supt. Car Dept.* Baltimore, Md.
Main Stem Div.:
S. B. Crawford, *M. M*..........Baltimore, Md.
J. M. Marsteller, *M. M*....Martinsburg, W.Va.
P. Hayden, *M. M*...........Piedmont, W.Va.
S. A. Souther, *M. M*..........Grafton, W. Va.
Pittsg. Div.:
M. B. Cutter, *Supt*............ ittsburgh, Pa.
I. N. Kalbaugh, *M.M*........ ..Glenwood, Pa.
Phil. Div.:
J. R. C. Wrenshall, *Supt*....Philadelphia, Pa.
Thos. Tresize, *M. M*..........Philadelphia, Pa.
Trans-Ohio Div.:
W. H. Harrison, *Supt. M. P*.......Newark, O.
Ohio Divs.:
J. M. Graham, *Supt*...............Newark, O.
E. L. Weisgerber, *M. M*...........Newark, O.
Akron & Wooster Branch Div.:
J. T. Johnson, *Supt*...............Akron, O
T. Taylor, *M. M*.... ...Chicago Junction, O
Chicago Div.:
P. C. Sneed, *Supt*................Garrett, Ind.
J. Billingham, *M. M*.... . ....Garrett, Ind.
Baltimore, & Ohio Southwestern R. R. Co.
4-8½g. 928 m. 194 lo. 6,896 c.
I. G. Rawn, *Gen. Supt*...... ....Cincinnati, O.
W. W. Peabody, *G. Man. & P.A.* Cincinnati, O.
J. G. Neuffer, *Gen. M. M*........Cincinnati, O.
Bangor & Aroostook R.R. 4-8½ g. 265 m. 22 lo. 402 c.
F. W. Cram, *Gen. Man. & P. A*..Bangor, Me.
Orlando Stewart, *Supt. M. P. & M.*. Oldtown, Me.
J. W. Comins, *M. C. B*.... . Oldtown, Me.
Bangor & Portland Ry. 4-8½ g. 50 m. 7 lo. 59 c.
C. Miller, *G. Man. & P. A*..........Bangor, Pa.
G. Holmes, *M. M*.... .... Bangor, Pa.
Barre R. R. Co. 4-8½ g. 26 m. 4 lo. 41 cars.
F. W. Stanyan, *G. S. & Pur. A*....Barre, Vt.
G. Jacobson, *M. M*........... ......Barre, Vt.
Chas. Robinson, *M. C. B*......Montpelier, Vt.
Barclay R. R. 4-8½ g. 15 m. 5 lo. 25 c.
E. O. Macfarlane, *Supt*........ Towanda, Pa.
Bath & Hammondsport R. R. 4-8½g. 10 m. 2 lo. 9 c.
H.S.Stebbins, *Man.& P.A.* Hammondsport, N.Y.
C. H. Griswold, *M. C. B.* Hammondsport, N.Y.
Bay of Quinte Ry. & Navigation Co.
4-8½ g. 85 m. 5 lo. 133 cars.
R. C. Carter, *Gen. Man*...... Deseronto, Ont.
F. S. Rathbun, *Pur. Agt*.....Deseronto, Ont.
Wm Evans, *M. C. B*.........Deseronto, Ont.
Beech Creek R. R. 4-8½ g. 185 m. 47 l. 2,887 c, N. Y. C. & H. R., Lessee.
J. D. Layng, *Gen. Man*...New York City, N. Y.
A. G. Palmer, *Supt. & P. A*..Jersey Shore, Pa.
La Mott Ames, *M. M* ... .Jersey Shore, Pa.
A. L. Dravenstadt, *M. C. B*...Jersey Shore, Pa
Bellaire, Zanesville & Cin. Ry. Co. 3g. 111m. 7 lo. 179c
J. K. Geddes, *Gen Man* ....Zanesvile, O.
J. A. Cox, *Pur. Agt*...... .... Zanesville, O.
V. B. Stubbins, *M. M*............Zanesville, O.
Bellefonte Central. 4-9 g. 28 m 3 lo. 70 cars.
F. H. Thomas, *Supt*.... . ...Bellefonte, Pa.
Robt. Frazer, *Pur. Agt*.... .Philadelphia, Pa.
Bellingham Bay & British Columbia Ry.
4-8½ g. 24 m. 4 lo. 60 cars.
C. L. Anderson, *Gen. Man., Supt. & Pur. A.* New Whatcom, Wash.
R. E. Nevins, *M. M. & M. C. B.*, New Whatcom, Wash.
Bennington & Rutland Ry. 4-8½ g. 54 m. 12 lo. 327 c.
E. D. Bennett, *Supt.& Pur. Agt.* Bennington, Vt.
Chas. J. McMaster, *M. M. & C. B*..Rutland, Vt.
Birmingham & Atlantic Ry. 4-8½ g. 35 m. 4 lo. 50 c.
G. A. Mathison, *Gen. Supt. & Pur. A.*, Talladega, Ala.
J.J.Thomas, Jr., *M. M.& M.C.B.* Talladega, Ala
Birmingham, Sheffield & Tenn. River Ry.
4-9 g. 120 m. 11 lo. 563 cars.
Philip Campbell, *G. M & Pur. A.* Sheffield, Ala
Black Hills & Fort Pierre. 3 g. 36.4 m. 5 lo. 125 c.
T. J. Grier, *Gen. Man*...... Lead City, S. D.
John A. Spargo, *M. M*......Lead City, S. D.
Bloomsburg & Sullivan.
4-9 g. 35 m. 5 lo. 25 cars.
F. M. Leader, *Gen. Man*.....Bloomsburg, Pa.
Boston & Albany R.R.
4-8½ g. 388 m. 249 lo. 7,612 c.
W. H. Barnes, *Gen. Man*.. ......Boston, Mass.
Wm. H. Taft, *Act. Supt. M.P.*, Springfield, Mass.
F. D. Adams, *Gen. M. C. B*.......Allston, Mass.
T. W. Adams, *For. C. Shop*..... Allston, Mass.
C. H. Barnes, *Div. M. M*. ......Boston, Mass.
Thos. B. Purvis, *For. Car Sh.*, Springfield, Mass.
J. E. Doran, *For. Car Sh*...East Albany, N.Y.
E. Priest, *Div. M M*.......East Albany, N. Y.
Boston & Lowell R. R. (*Leased to Boston & Maine*)
Boston & Maine R.R. 4-8½g. 1292.65m. 570lo. 11,614c.
Lucius Tuttle, *Pres*............. Boston, Mass.
T. A. MacKinnon, *Gen. Man*.... Boston, Mass.
J. A. Farrington, *Pur. Agt*.......Boston, Mass.
Henry Bartlett, *Supt. M. P*......Boston, Mass.
A. B. Barrett, *Div. M. M* ..... Boston, Mass.
J. T. Chamberlain, *M. C. B*..... Boston, Mass.
Wor., Nash. & Port. Div.:
F. Barr, *Supt*.............. ...Nashua, N. H.
C. L. Aiken, *Div. M. M* ...Worcester, Mass.
Southern Div.:
G. F. Evans, *Supt*........ ... Boston, Mass.
E. T. Sumner, *Div. M. M.* E. Cambridge, Mass
Passumpsic Div.:
H. E. Folsom, *Supt*.. ....Lyndonville, Vt.
L. C. Todd, *Div. M. M*... . Lyndonville, Vt.
Concord Div.: H. E. Chamberlain, *Supt.*, Concord, N. H
Chas. H. Wiggin, *Div. M. M.* Concord, N. H.
Conn. River Div.:
H. E Folsom, *Supt*.... ....Lyndonville, Vt.
W. H. Stearns, *Div. M. M.* Springfield, Mass
Boston & Providence R.R......(*See Old Colony R. R.*)
Boston, Revere Beach & Lynn R.R. 3 g. 14 m. 12 lo. 53c.
J. A. Fenno *Supt & P Agt*.....Boston, Mass.
R. D. Sutherland, *M. M*...... ...Boston, Mass.
John Coghlan, *M. C. B*...... ....Boston, Mass
Bradford, Bordell & Kinzua R. R. 3 g. 194m. 6lo. 150c.
J. C. McKenna, *Gen. Man. & P.A.* Bradford, Pa.
Brainerd & Northern Minnesota R. R.
4-8½ g. 50 m. 9 lo. 500 cars.
F. W. Kimball, *Supt*.....Minneapolis, Minn.
W. F. Brooks, *Pur. Agt*..Minneapolis, Minn.
J. N. Sanborn, *M.M.&M.C.B.* Brainerd, Minn.
Brooklyn & Brighton Beach R. R.
4-8½ g. 15 m. 8 lo. 44 c. 8 frt. c.
Wm. Finley, *Supt. & M M*....Flatbush N. Y
Brooklyn Elevated R.R. 4-8½ g. 20 m. 95 lo. 290 c.
J. D. Barton, *Gen. Supt*.. .....Brooklyn, N.Y.
E. P. Mallinson, *M. M*...... ..Brooklyn, N.Y.
Brunswick & Western R. R. (*See Plant System.*)
Buctouche & Moncton Ry. 4-8½g. 32m. 2 lo. 38c.
E. G. Evans, *Gen Man* .... Moncton, N. B.
Jas. Carghlan, *M. M*.... .... Moncton, N. B.
F. N. Hall, *Pur. Agt*.... ......Moncton, N. B.
Buffalo, Attica & Arcade R. R. Co.
4-8½ g. 20 m. 1 lo. 2 c.
S. S. Bullis, *Gen. Man*..........Olean, N. Y.
G. W. Conklin, *G.S., P.A., M. M. & M. C. B.*, Attica, N. Y.
Buffalo, Rochester & Pittsburg Ry.
4-8½g. 355 m. 135 lo. 7,246 c.
R. G. Matthews, *Gen. Supt*.....Rochester, N.Y.
G. E. Merchant, *Pur. Agt*...Rochester, N. Y.
C E. Turner, *Supt. M. P* .. .Rochester, N. Y.
F. G. Lauer, *M. M*.... ......Rochester, N. Y.
M. C. B.............Buffalo, N. Y.
Buffalo & Susquehanna Ry.
4-8½ g. 75 m. 10 lo. 1,150 cars.
G. W. Goodyear, *Gen. Man*...Buffalo, N Y.
E. A. Cheney, *Pur. Agt*.... ......Austin, Pa.
John D. Campbell, *Supt. M. P*....Austin, Pa.
S. W. Huston, *M. M*.... ....Austin, Pa.
Burlington & Mo. Riv. R. R.(in Neb.) (*See C., B.&Q.*).
Burlington & North-West'n and Bur.& West'n Rys.
4-8½ g. 123 m. 7 lo. 397 c.
Robt. Law, *Man. & P. A*.......Burlington, Ia.
Adam Metz, *M. M*..............Burlington, Ia
Burlington, Cedar Rapids & Northern Ry.
4-8½ g. 1,135 m. 119 lo. 4,608 cars.
C. J. Ives, *Pres*............ ..Cedar Rapids, Ia.
Robt. Williams, *Gen. Supt*....Cedar Rapids, Ia.
W. J. Morrison, *Pur. Agt*. .Cedar Rapids, Ia.
R. W. Bushnell, *M. M*........Cedar Rapids, Ia.
G. S. Dickover, *M. C. B* ..Cedar Rapids, Ia.
Butte, Anaconda & Pac. Ry. 4-8½g. 42m. 13 l. 355c.
M. Donahoe, *Gen. Man* ... Anaconda, Mont.
A. Harrity, *M. M*...... .... Anaconda, Mont.

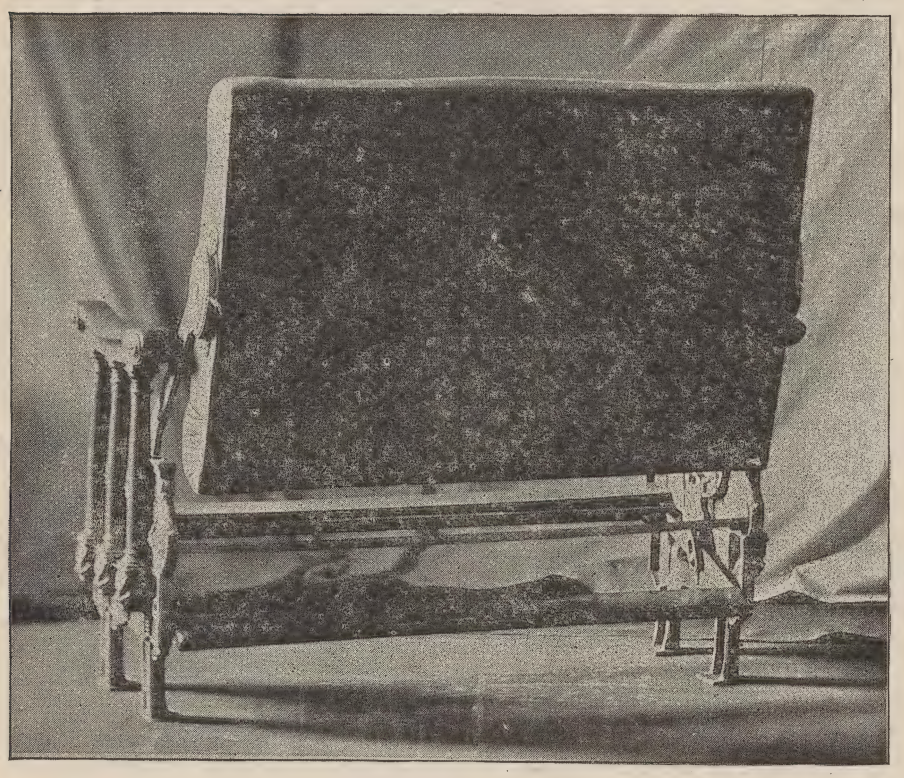
C

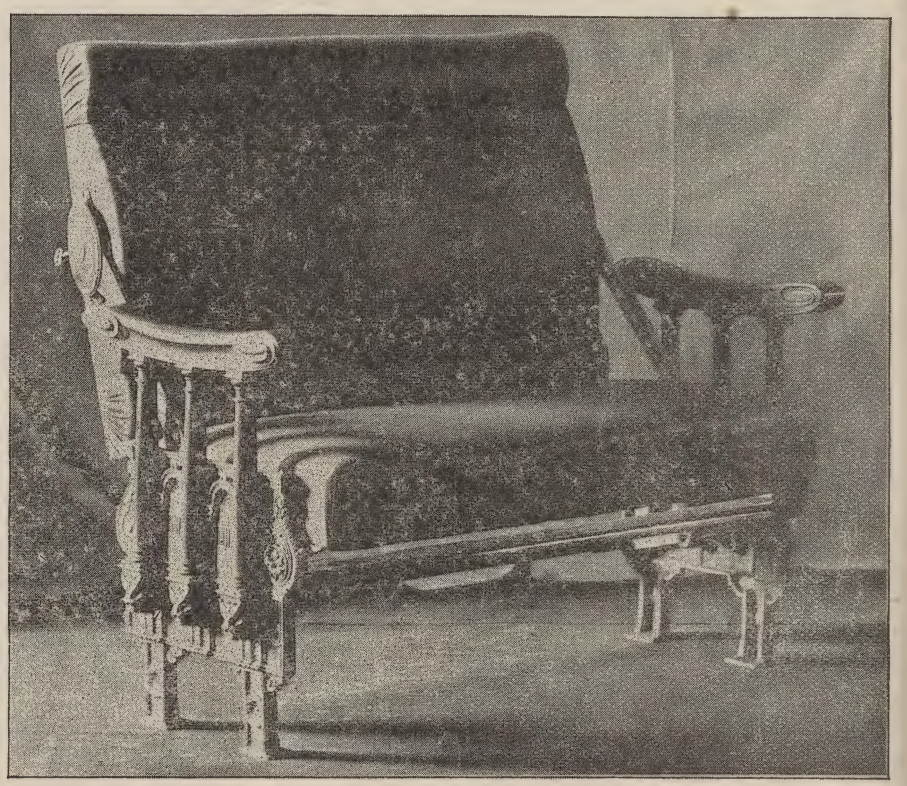
Calumet & Blue Island Ry. 4-8½g. 269 m. 51 l. 2,500c.
W. G Brimson, *Pres. & G. M*..Chicago, Ill.
L. D. Doty, *Pur. Agt*........So. Chicago, Ill.
C. L. Clifford, *M. M* ....So. Chicago, Ill.
E. B. Smith, *M. C. B*............Chicago, Ill.
Camden & Atlantic R. R. ....(*See Penna. R.R.*)
Canada Atlantic Ry. 4-8½ g. 134.8 m. 25 l. 2,263c.
E. J. Chamberlin, *G.M.&P.A.* Ottawa, Ont.
M. Donaldson, *S.&M.M.&M.C.B.*, Ottawa, Ont.
Canadian Pacific Ry.
4-8½ g. 6, 181 m. 615 lo. 675 pass. 15,769 frt. c.
W. C. Van Horne, *Pres* ... .Montreal, Can.
R. Atkinson, *Act. M. M*.........Montreal, Can.
John Higginson, *M. C. B*.......Montreal, Can.
A. C. Henry, *Pur. Agt*..... ....Montreal, Can.
Atlantic Div.:
H. P. Timmerman, *Supt*......St. John, N. B.
.......McAdam, N. B.
E. Div.: C. W. Spencer, *Gen. Supt.* Montreal, Can
George Preston, *M.M*.........Farnham, Que
W. Div.: Wm. Whyte, *Gen. Supt.* Winnipeg, Man.
W. Cross, *M. M*.... ....Winnipeg, Man
O. & Q. Div.:
J. W. Leonard, *Gen. Supt*.....Toronto, Ont
George McKinnon, *M. M*.......Toronto, Ont.
G. S. Mackinnon, *M. M*........Farnham, Que.
Pac. Div.: H. Abbott, *Gen. Supt.* Vancouver, B.C
L. R. Johnson, *M. M*.......Vancouver, B. C.
Cape F'r & Yadkin V.R.R. 4-9 g. 338 m. 24 lo. 647 c.
John Gill, *Rec*........ ....Baltimore, Md.
J. W. Fry, *Gen. Man.&P. A.*.Greensboro, N. C.
I. W. Clark, *M. M*..........Fayetteville, N. C.
Carolina Central. 4 g. 267 m. 24 l. 354 c.
J. C. Winder, *Gen. Man* ......Portsmouth, Va
L. T. Myers, *Gen. Supt.&P.A.* Portsmouth, Va.
Carolina Midland R. R 4-8½ g. 55 m. 4 lo. 29 cars.
J. C. Keys, *Gen. Supt*........Charleston, S. C.
W. T. Withington, *M.M*......Blackville, S. C.
Carrabelle, Tallahassee & Georgia R. R. 50 m.
S. D. Chittenden, *Gen. Man.* Tallahassee, Fla.
S. A. Sheppard, *M. M*.. .... Tallahassee, Fla.
Carson & Colorado. 3 g. 299 m. 8 lo. 227 cars.
H. M. Yerington, *P. & G. S.* Carson City, Nev.
Hume Yerington, *Pur. Agt*..Carson City, Nev.
W. L. Wolley, *M. M*.........Hawthorne, Nev.
C. A. Brulin, *M. C. B*......,..Carson City, Nev.
Carthage & Adirondack Ry.
(*See N. Y. C. & H. R. R. Co.*
Central Branch Union Pac. (*See Mo. Pac.; (3) Div.*)
Central New York & Western R. R.
4-8½ & 3 g, 46 m. stand.& 18m. narrow g. 11 lo. 91c.
M. S. Blair, *Gen. Supt*.... Hornellsville, N. Y.
L. B. Heers, *M. M*.............Angelica, N. Y.
Central Ontario Ry. 4-8½ g. 104 m. 8 lo. 125 c.
Geo. Collins, *Gen. Supt.& P.A*..Trenton, Ont.
D. Duff, *M. M.& M.C. B*.........Trenton, Ont.
Central Pac. R. R. (*See Southern Pacific Co.*
Central Penn. & Western R.R. 4-9 g. 31 m. 2 lo. 10c
S. B. Haupt, *Gen. Man*. ...Watsontown, Pa.
Central R. R. & Banking Co. of Georgia.
4-8½ g. 1,417 m. 209 lo. 5,345 cars.
H. M. Comer, }
R. Somers Hayes, } *Receivers*. Savannah, Ga.
T. D. Kline, *Gen. Supt*.. ....Savannah, Ga
J. W. Comer, *Pur. Agt* ....Savannah, Ga.
T. B. Irvin, *M. M* .. ..Savannah, Ga.
So.-West'n Div.: B.C.Epperson, *Supt.* Macon, Ga.
John Dempsey, *M. M*...............Macon, Ga.
J. L. Whitsitt, *M. M*.......... .. Columbus, Ga.
S. A. Charpiot, *M. C. B*..... ....Macon, Ga.
W. H. Stubb, *M. M*..............Augusta, Ga.
Central R.R. of New Jersey.
Operating Cumb. & Maurice River and Lehigh & Lackawanna roads. 4-8½ g. 628 m. 442 l. 29,780 c.
J. H. Olhausen, *Gen. Supt*..Jersey City, N. J
G. D. W. Smith, *Pur. Agt*.. Jersey City, N. J.
C. A. Thompson, *Supt. M. P.* Jersey City, N. J
N. J. Cent. Div.:
W. H. Peddie, *Supt*..........Jersey City, N.J
W. L. Hoffecker, *M. M*..Elizabethport, N. J.
N. J. South. Div.:
W. V. Clark, *Supt*...... ....Long Branch, N. J
W. Montgomery, *M. M*.... .. Manchester, N.J
L. & S. Div.:
G. W. Twining, *Supt*....... Mauch Chunk, Pa.
J. G. Thomas, *Asst. Supt. M.B.& E.* Ashley, Pa.
Central R. R. of S. C. (*See Atlantic Coast Line.*)
Central Texas & N'w'n R. R. (*See Hous. & Tex. Cen*
Central Vermont R. R. 4-8½ g. 796 m. 200 lo. 4,314 c
F. W. Baldwin, *Gen. Supt*... . St. Albans, Vt.
W. B. Hatch, *Pur. Agt* ....St. Albans, Vt.
C. E. Fuller, Jr., *Supt. M. P*...St. Albans, Vt
W. J. Robertson, *M. C. B*.. .. St. Albans, Vt
Rut. Div.: J. Burdett, *Supt*.........Rutland, Vt.
G. W. Kinney, *M. M*...... ......Rutland, Vt.
New London No'n R. R. 121 m. 24 lo 382 c
D. Mackenzie, *Supt*..... ....N. London, Ct.
J. Hinchy, *M. M*.... . ... New London, Ct.
L. Beckwith, *M. C. B* ....New London, Ct.
Og. & L. Cham. Div.; 4 8½g. 118m. 28 l. 1,583 c.
Frank Owen, *Supt*..........Ogdensburg, N Y.
Thos. Rumney, *Div. M. M*......Malone, N. Y.
Charleston & Savannah (*See Plant System.*)
Charleston, Sumt. & No. R.R. 4-9g. 150m. 11 lo. 306c
C. Millard, *Supt. & Pur. Agt*...Sumter, S. C.
E. M. Raynor, *M. M*..............Sumter S. C.
Charlotte, Columbia & Augusta R.R. (*See S. Ry. Co.*)
Chattanooga Southern Ry. 4-8½g. 92 m. 5 lo. 124 c.
J. W. Burke, *Rec.& Man.* Chattanooga, Tenn.
H. T. Ellison, *M. M*.......Chattanooga, Tenn.
H. P Eager, *Pur. Agt*....... ....Chatt, Tenn.
Chat., Rome & Colum. Ry. 4-9 g. 138 m. 9 lo. 79 c.
E. E. Jones, *Rec. & Pur. Agt*......Rome, Ga.
W. A. Love, *M. M. & M. C. B*......Rome, Ga
Chateaugay R. R. 3 g. 73 m. 11 lo. 514 cars.
J. N. Stower, *Gen. Man*.........Plattsburg, N.Y.
F. M. Johnson, *Supt.& P.A*..Plattsburg, N. Y.
J.M.Davies, *M.M.&M.C.B.* Lyon Mountain, N.Y.
Chesapeake & Nashville
4-9 g. 35 m. 3 lo. 45 ft. 2 pass. cars.
Gen. John Echols, *Gen. Man*. .Louisville, Ky.
Chesapeake & Ohio Ry. 4-8½ g. 1,362 m. 359 l. 13,741c.
Geo. W. Stevens, *Gen. Man*... Richmond, Va.
W. F. La Bonta, *Pur. Agt* ....Richmond, Va.
W. S. Morris, *Supt. M. P*......Richmond, Va
T. S. Lloyd, *M. M*.......... ....Richmond, Va.
A. F. Stewart, *M. M*......Huntington, W. Va.
C. Quandt, *M. M*.... ....Covington, Ky.
Chesapeake, Ohio & Southwestern Ry. Co. and Ohio Valley Ry. Co.
John Echols, *Gen. Man*........ Louisville, Ky.
F. D. Thompson, *Gen. Supt*...Louisville, Ky.
Geo. Dickey, *Gen. M. M*...... Paducah, Ky.
Wm. P. McDowell, *Pur. Agt*..Louisville, Ky.
Chester & Lenoir Ry 3 g. 110 m. 6 lo. 92 cars.
L. T. Nichols, *Gen. Supt.&P.A.*.Chester, S.C.
J. S. Cothraup, Jr., *M. M*......Chester, S. C.
S. D. Scarborough, *M. C. B*...Chester, S. C.
Chicago & Alton R.R. 4-8½ g. 850 m. 240 lo. 7,800c.
C. H. Chappell, *Gen Man*. ....Chicago Ill.
A. V. Hartwell, *Pur. Agt*.........Chicago, Ill
J. Johann, *S. Mch* .... Bloomington, Ill.
J. Townsend, *M.C.B*.............. Bloomington, Ill.
Chicago & Erie R.R. (*See N. Y., L. E. & W. Ry.*
Chicago & Eastern Illinois R. R.
4-8½ g. 502 m. 138 lo. 8,780 c.
E. P. Broughton, *Supt* ....Chicago, Ill.
G. J. Schappert, *Pur. Agt*.........Chicago, Ill.
Allen Cook, *S. M. P*........ ..... Danville, Ill.
J. J. Curtis, *Div. M. M*..........Danville, Ill.
Chicago, Ft. Madison & Des Moines R. R.
4-8½ g. 71 m. 3 lo. 28 c.
E. F. Potter, *Gen. Man.&P.A.* Ft. Madison, Ia.
Chicago & Gr. Trunk and Det., Gr. Haven & Mil. Ry; Cincinnati, Saginaw & Mackinaw R. R.; Toledo, Saginaw & Muskegon R. R.
4-8½ g. 524 m. 206 lo. 3,883 cars.
W. J. Spicer, *Gen. Man*..... ....Detroit, Mich.
J. S. Lorimer, *Gen. Store Keeper*, Detroit, Mich.
H. Roberts, *Mech. Supt*..........Detroit, Mich.
T. Sutherland, *Asst. Car. Supt*..Ft. Gratiot, Mich.
J. A. Slack, *Asst. Mech. Supt.* Battle Creek, Mich.
Chicago & Iowa R.R. (*See C., B. & Q.*
Chicago & Northwestern Ry.
4-8½ g. 5,006.13 m. 1,018 lo. 35,613 cars.
John M. Whitman, *Gen. Man*......Chicago, Ill
Chas. Hayward, *Pur. Agt*..........Chicago, Ill.
Robt. Quayle, *Supt. M. P. & M*...Chicago, Ill.
C. A. Schroyer, *S. C. D*............Chicago, Ill.
Wis. Div.: W. A. Gardner, *Supt*.... Chicago, Ill.
J. Heath, *M. M*...... .... .Chicago, Ill.
Gal. Div.: J. C. Stuart, *Supt*.........Chicago, Ill.
R. Erkshine, *M. M*..................Chicago, Ill.
Penn. Div.: W.B. Linsley, *Supt.* Escanaba, Mich.
J. W. Clark, *M. M*............Escanaba, Mich.
Mad. Div.: R. A. Cowan, *Supt*.... Baraboo, Wis.
H. D. Page, *M. M*............... Baraboo, Wis.
W. & St. P. Div.:
W. P. Cosgrove, *Supt*... ....Winona, Minn.
Wm. McIntosh, *M. M*..........Winona, Minn
Ia. Div.: P. Hallonbeck, *Supt*.........Boone, Ia.
J. Cockfield, *M. M*..................Clinton, Ia.
No. Iowa Div.: H. M Hughes, *S*..Eagle Grove, Ia.
Wm. Hutchinson *Foreman*...Eagle Grove, Ia
Ashland Div.:
G. F. Bidwell, *Supt*............Kaukauna, Wis.
M. M..........Kaukauna, Wis
Chicago, Peoria & St. Louis Ry.
4-8½ g. 225 m. 38 lo. 1,867 cars.
C. H. Bosworth, *G. M. & Rec.*, Springfield, Ill.
F. C. Dodds, *Pur. Agt*.........Springfield, Ill.
W. J. Hemphill, *M.M.&M.C.B.* Springfield, Ill.
Chicago & West. Michigan.
4-8½ g. 564 m. 76 lo. 2,901 cars.
Chas. M. Heald, *G. M*.... Grand Rapids, Mich.
Russell Wallace, *Pur. Agt.* Grand Rapids, Mich.
B. Haskell, *S. M. P* ....Grand Rapids, Mich
W. K. Christie, *M. M* ....Muskegon, Mich
......Muskegon, Mich.
Chicago, Bur. & Kan. City Ry. (*See C., B. & Q.*
Chicago, Burlington & Northern
4-8½ g. 371 m. 58 lo. 3,420 c.
J. R. Hastings, *Supt*...... ....St. Paul, Minn.
Geo. Hargreaves, *Pur. Agt*........Chicago, Ill.
W. H. Lewis, *M. M*....... ...La Crosse, Wis.
Chicago, Burlington & Quincy R R
4-8½ g. 5,730 m. 875 lo. 34,501 cars.
C., B. & Q., East of Mo. Riv:
W. F. Merrill, *Gen. Man*.... ....Chicago, Ill.
Geo. Hargreaves, *Pur. Agt*........Chicago, Ill.
G. G. Yeomans, *Asst. P. A*....... Chicago, Ill
G. W. Rhodes, *Supt M. P*.........Aurora, Ill
W. Forsyth, *Mech. Eng*.......... Aurora, Ill.
R. D. Smith, *M. M*.................Chicago, Ill
Chi. Div.: H. D. Judson, *Supt*.... ....Aurora, Ill
A. Forsyth, *M. M*.. ....Aurora, Ill
Galesburg Div.:
W. B. Throop, *Supt*..........Galesburg, Ill.
R. W. Colville, *M. M*.........Galesburg, Ill.
St. L Div.: W. G. Besler, *Supt.* Beardstown, Ill.
C. W. Eckerson, *M. M* .....Beardstown, Ill.
Ia. & Mo. Lines.: C.M.Levey, *Supt.* Burlington, Ia
J. West, *M. M*...............W. Burlington, Ia.
East. Div.: O. E. Stewart, *Supt*.. Ottumwa, Ia.
J. F. Deems, *M. M*... .... Ottumwa, Ia
Joel West, *M. M*... . West Burlington, Ia.
West'n Div.: J.H.Duggan, *Supt*...Creston, Ia.
E. Jones, *M.M* . ...Creston, Ia.
Bur. & Mo. R. R. in Neb.:
4-8½ g. 3,510.7 m. 329 lo. 9,214 cars.
G. W. Holdrege, *Gen. Man*.......Omaha, Neb
D. Hawksworth, *Supt. M. P.* Plattsmouth, Neb.
E. S. Greusel, *M. M* ....Havelock, Neb.
R. T. Smith, *M. M*.... ....Lincoln, Neb.
A. B. Pirie, *M. M* .. ..Wymore, Neb
R. B. Archibald, *M. M*...... McCook, Neb.
J. P. Reardon, *M. M*. .... Alliance, Neb.
Chicago, Iowa & Dakota Ry. 4-8½ g. 27 m. 2 l. 17 c
W. S. Porter, *Gen. Man.&Pur.A*....Eldora, Ia
Chicago, Kalamazoo & Saginaw Ry.
4-8½ g. 45 m. 4 lo. 15 cars.
W. S. Dewing, *Gen. Man*....Kalamazoo, Mich.
H. C. Potter, *Pur. Agt*. ....Kalamazoo Mich
Chicago, Milwaukee & St. Paul Ry.
4-8½ g. 6,154m. 852 lo. 28,965 cars.
A. J. Earling, *Gen. Man*...........Chicago, Ill.
J. T. Crocker, *Pur. Agt*........ ..Chicago, Ill.
J. N. Barr, *Supt. M. P. & C. D.* Milwaukee, Wis.
A. E. Manchester, *A. S. M.P.* Milwaukee, Wis.
Geo. Gibbs, *Mech. Eng*. .. ... Milwaukee, Wis.
J. J. Hennessey, *M. C. B*. .Milwaukee, Wis.
Chicago & Milw., Chicago & C. B. and Chicago Evanston Divs.:
J. B. Cable, *Supt*....... .. ..Chicago, Ill.
C. & C. B. Div. in Ia.: J. F. Gibson, *Supt.*,
Kansas City Div.: Marion, Ia.
E. D. Wright, *Supt*.... .... Kansas City, Mo.
La Crosse Div.:
D. C. Cheney, *Supt* ....Milwaukee, Wis.
P. du Chien & Min. Point Div.:
W. W. Collins, *Supt* .... Milwaukee, Wis.
Northern Div.: J.M. Bunker, *Supt.* Milwaukee, Wis.
Dubuque Div.: J. W. Stapleton, *S*..Dubuque, Ia.
Geo. H. Brown, *M. M*............Dubuque, Ia.
John Taylor, *M. M*.... ......Minneapolis, Minn.
Chicago, Paducah & Memphis R. R.
4-8½ g. 103 m. 4 lo. 71 cars.
B. F. Johnston, *Gen. Man*......St. Elmo, Ill.
Chicago, Rock Island & Pac. Ry.
4-8½ g. 3,574 m. 564 lo. 16,329 cars.
W. H. Truesdale, *3d V. P.&G.M.* Chicago, Ill.
F. A. Marsh, *Pur. Agt*...... ......Chicago, Ill.
Geo. F. Wilson, *S. M. P* .. ..Chicago, Ill.
Lines East of Missouri River:
Ill. Div.: C. L. Nichols, *Supt*.....Blue Island, Ill
J. W. Fitzgibbon, *M. M*..........Chicago, Ill.
A. Childs, *M. C. B*.................Chicago, Ill.
Ia. Divs.: W. H. Stillwell, *Supt*..Des Moines, Ia.
A. L. Studer, *M. M*......... .....Stuart, Ia.
Des.M.Val.Div.: C.N.Gilmore, *Supt.* Des Moines, Ia.
J. B. Kilpatrick, *M. M*....Valley Junction, Ia.
So.-Wn.Div.: W. J. Lawrence, *Supt.* Trenton, Mo.
W. Gessler, *M. M*........ ......Trenton, Mo.
Lines West of Missouri River:
H. Monkhouse, *A. S., M. P*... Horton, Kan.
Chicago, St. Louis & Pittsburgh R.R. (*See Penn Co.*)
Chicago Great Western Ry.
4-8½ g. 922 m. 147 l. 5,082 c.
Samuel G. Stickney, *Gen. Man.* St. Paul, Minn.
J. Warwick, *Pur. Agt*......... ..St. Paul, Minn.
Tracy Lyor, *Supt. M. P*...... St. Paul, Minn.
A. N. Hayes, *M. C. B*........ St. Paul, Minn.
C. E. Slayton, *Div. M. M* ......Oelwein, Ia.
Chicago, St. Paul, Minneapolis & Omaha Ry.
4-8½ g. 2,015 m. 270 lo. 9,604 cars.
E. W. Winter, *Gen. Man*. . ..St. Paul, Minn.
W. H. S. Wright, *Pur. Agt*......St. Paul, Minn.
J. J. Ellis, *M. M*. . . ..St. Paul, Minn.
H. L. Preston, *M. C. B*.... .. ..Hudson, Wis.
Chicago & Southeastern Ry. 4-8½ g. 110 m. 11 lo. 100 c.
H. Crawford, Jr., *Gen. Man. & Pur. Agt.*, Chicago, Ill.
J. W. Roberts, *M M.& M.C.B*..Lebanon, Ind.
Chicago & Texas Ry. Co.
4-8½ g. 55 m. 10 lo. 244 cars.
O. L. Garrison, *V. P. & G. M.* St. Louis, Mo
S. L. Sherer, *Pur. Agt*.........St. Louis, Mo.
J. W. Lewis, *M.M.&M.C.B*..Murphysboro, Ill.
Chicago & Western Indiana R. R. Co. and The Belt Ry. Co. of Chicago.
4-8½ g. 55 m. 45 l. 100 cars.
—— *Pres. & Gen. Man*.... .....Chicago, Ill.
C. C. Nash, *Pur Agt*.... ....Chicago, Ill.
P. H. Peck, *M. M*...................Chicago, Ill.
Choctaw, Oklahoma & Gulf Ry.
4-8½ g. 107 m. 7 lo. 1,035 cars.
Francis J. Gowen, *Pres. & Gen. Man.* Philadelphia, Pa.
H. E Yarnall, *Pur. Agt.* So. McAlester, I. T.
J. Cunningham, *M. M*....So. McAlester, I. T.

THE STANDARD PATENTED

CAR SEAT and FOOT REST

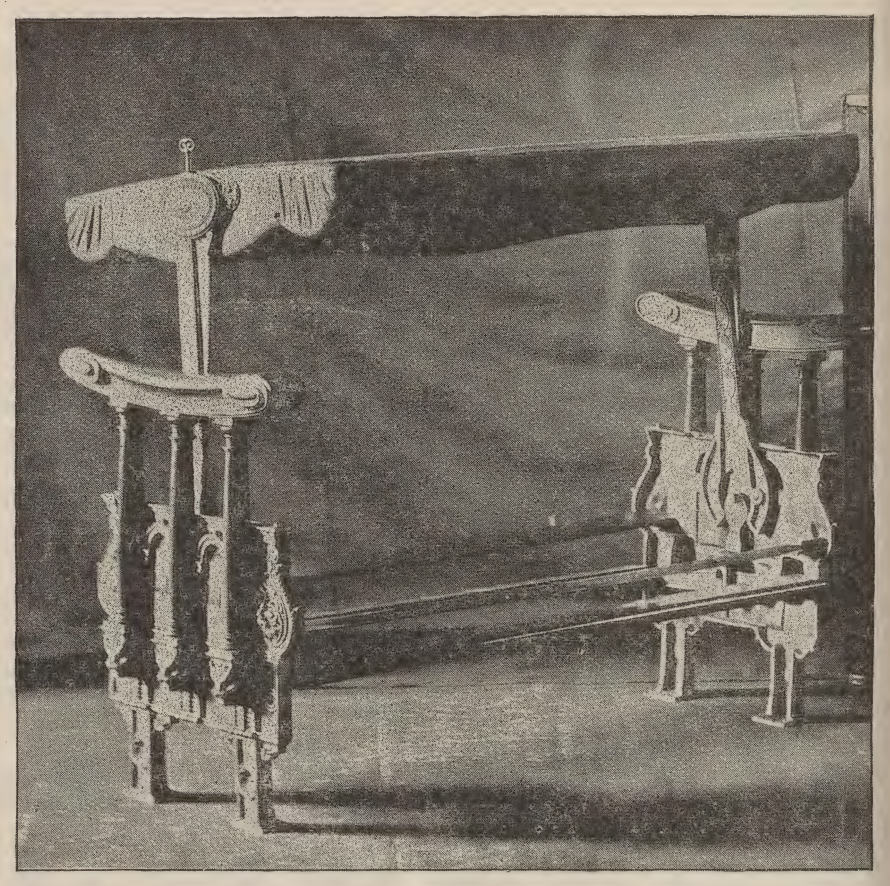
(COMBINED).





The Newest and Best Patented Car Seat ever Invented with Patented Foot Rest.

Every Feature of this Seat Superior to any yet Invented.



THE STANDARD PATENTED CAR SEAT,

No. 375 Lexington Ave., New York City.

Cincinnati & Kentucky Southern Ry.
4-8½ g. 13 m. 2 lo.51 c.
E. Ritchie, *Gen. Man.& P. A*....Cincinnati, O.
W. L. Peairs, *M. M*.. ....Yosemite, Ky
Cin. & Muskingum Valley Ry.
4-9 g. 148.5 m. 20 l. 414 c.
C. M. Bennett, *Supt*... ....Zanesville,O.
H. O. Hukill, *Pur. Agt* .....Pittsburgh, Pa.
Wm. Meikle, *Genl. For. Shops*....Lancaster,O.
Cincinnati & Northwestern Ry.
4-8½ g. 14 m. 2 lo. 40 cars.
R. Simpson *Gen.Man.&Pur.Agt*.Cincinnati,O.
O. K. Simpson, *M. M*.. ....Cincinnati, O.
Cincinnati & Westwood R. R. 4-8½ g. 9 m.2 lo. 9 c
J. N. Gamble, *G. M., S. & P. A*..Cincinnati O
Cin., Georgetown & Portsmouth. 3 g. 42 m. 5 lo. 75 c.
E. W. White, *G. M. & Pur. Agt*..Cincinnati,O
J. M. Myers, *Supt*.......... ..Cincinnati, O.
P.T. Dunn, *F.of Shops&M. C. B*.Cincinnati, O
Cincinnati, Hamilton & Dayton; Dayton & Mich.: Cin., Ham. & Ind.; Cincinnati, Dayton & Ironton R. R.; Cincinnati, Dayton & Chicago R. R,; Columbus, Findlay & Northern; Bowling Green, Cincinnati & Dayton R. R's.
4-8½ g. 622 m. 167 l. 8,101 cars.
Wm. M. Green, *Gen Man*......Cincinnati, O.
G. R. Balch, *Pur. Agt*. ....Cincinnati, O.
C. H. Cory, *Supt. M. P*...... .... Lima, O.
A. J. Ball, *Div. M. M*.... ....Dayton, O.
J. M Percy, *Div. M. M*..........Cincinnati, O.
Cincinnati. Jackson & Mackinaw R. R.
4-8½ g. 285 m. 29 lo. 1,470 cars.
F. B. Drake, *Rec., Gen. Man.&P.A*.Toledo, O
A. H. Watts, *M. M*...... .....Marshall, Mich
Cin., Leb. & North. Ry. 4-8½ & 3 g. 38 m. 5 l. 46 c.
Geo. Hafer. *Gen. Man. & P. A* ...Cincinnati. O.
Jos. Underwood, *M. C. B*. ......Cincinnati, O.
Cincinnati, New Orleans & Texas Pacific Ry. Co.
(*See Q. & C.*)
Cincinnati, Portsmouth & Virginia R. R.
4-8½ g, 112 m. 10 lo. 229 cars.
Sam'l Hunt, *Pres. & Gen.Man* Cincinnati, O.
T. Hunt, *Pur. Agt*.......... . Cincinnati, O
John C.Homer,*M.M.& M.C.B*.Portsmouth, O.
Cincinnati, Richmond & Chi. R. R..(*See C.,St.L.& P.*)
Cincinnati, Saginaw & Mackinaw R. R.
(*See C. & G. T. Ry. Co.*)
Cin.,Wabash & Mich. Ry. (*See C.,C.,C. & St.L.R.R.*
Clarendon & Pittsford Ry. 4-8½ g. 12 m. 3 l. 113 c.
F. D. Proctor. *Gen. Mgr*..........Proctor, Vt.
G. H. Davis, *M. M*...............Proctor, Vt.
E. J. Boyce. *Pur. Agt*............Proctor, Vt.
Cleveland, Akron & Columbus Ry.
4-9 g. 177 m. 42 lo. 2 946 cars.
Geo. W. Saul, *Pres.&Gen.Man*..Cleveland.O.
W. J. Vance, *M. M.& M.C.B*..Mt. Vernon, O.
Cleve ,Cant.& South.R.R. 4-8½g. 210m. 37 l.3,003 c.
J. W. Wardwell, *Rec. & Man*.. Cleveland, O.
John Bean, *M. M. & Pur. A*.. .....Canton, O.
H. A. Kennedy, *P. A*...............Canton, O.
Cleveland & Marietta Ry.4-8½g.105 m. 23 l. 1,008 c.
W.A.Baldwin, *Pres.,G.M.&P.A*.Cambridge,O.
J. Glasser, *M. M*..... . ...Cambridge, O.
Cleveland & Pittsburgh. (*See Penna. Co.*)
Clev., Cinn., Chi. & St. Louis:
4-8½ g. 2,300 m. 455 lo. 2,007 cars.
C. E. Schoff, *Asst. Gen. Man* ...Cincinnati, O.
A. M. Stimson, *Pur. Agt* ......Cincinnati. O.
William Garstang,*Supt.M.P*.Indianapolis,Ind.
Cinn.-Sandusky Div.:
W. Gibson, *Supt*..... ....Springfield, O.
James A. Keegan, *M. M* ... . Delaware, O.
Clev. & Indianapolis Div.:
T. J. Higgins, *Supt*.......... ..Cleveland. O.
E. E. Hudson, *M. M*... .... Bellefontaine, O.
St. Louis Div.:
E. M. Neel, *Supt*.................Mattoon, Ill
G. S. McKee, *M. M* ....Mattoon, Ill.
Chicago Div.:
G. W. Bender, *Supt*..........Indianapolis, Ind.
F. M. Lawler, *M. M*..........Brightwood, Ind
Cairo Div.:
W. P. Orland. *M. M*............Mt. Carmel, Ill.
P. & E. Ry.: J.A.Barnard, *Gen.Man*. .Urbana, Ill.
J. McClurg, *M. M*........ ....Urbana, Ill.
Mich. Div.: S. T. Blizard, *Supt*... Wabash, Ind.
C. H. Doedler, *M. M*...... ......Wabash, Ind.
Cleveland, Lorain & Wheeling Ry.
4-8½ g. 192 m. 59 lo. 4,025 cars.
W. R. Woodford, *Gen. Man*.. .. Cleveland, O.
F. E. Now, *Pur. Agt*.......... ..Cleveland, O.
James Graham, *M. M*.. .... Lorain, O.
F. H. Stark, *M. C. B*.................Lorain. O.
Colorado Eastern R.R.Co. 3 g. 17 m. 2 lo. 13 cars.
C. M. Wicker, *Gen Man*............Denver, Col.
R. McDowell, *Gen Pur. Agt*......Denver, Col.
H. Twining, *M. M. & M. C. B*.....Denver, Col.
Colorado Midland Ry. 4-8½g. 233 m. 51 l. 1,415 c.
(*See A., T. & S. F. Rd.*)
Columbia & Greenville R. R. .....(*Rich.& Danville.*)
Columbia & Puget Sound R.R. 3 g. 62 m. 10 lo. 200 c.
C J. Smith, *Gen. Man*.. ....Seattle, Wash.
W. E. Nichols. *Pur. Agt*........Seattle, Wash.
D. O'Leary, *M. M. & M. C. B* ...Seattle, W. T.
Columbus Southern. 4-9 g. 88 m. 5 lo. 106 cars.
S.F. Parratt. *Gen. Man*........Columbus, Ga.
H.C. Hill.*Gen.Supt,&Pur.Agt*.Columbus,Ga.
J, McC. Hill, *M.M. & M.C. B*..Columbus, Ga.
Columbus, Sandusky & Hocking Ry.
4-8½ g. 267 m. 50 lo. 3,809 c.
Wm. Thornburgh, *G. Supt*.....Columbus, O.
G. C. Hoover, *Pur. Agt*........Columbus, O.
Geo.F.Gardiner,*M.M.&M.C.B*.Columbus, O.
Columbus & Rome R. R. (*See Cent. of Ga.*)
Columbus, Hocking Valley & Toledo Ry.
4-8½ g. 325 m. 109 lo. 7,845 cars.
C. B. Duffy, *Pur. Agt*...........Columbus, O.
S. S. Stiffey, *M. M* ....Columbus, O.
Colusa & Lake R. R. 3 g. 22 m. 3 lo. 30 cars.
E. A. Harrington,*Man.,Supt.&P.A*.Colusa,Cal
M. E. Burrows, *M. M* ....Colusa, Cal.
T. Sullivan, *M. C. B*...............Colusa, Cal.
Concord & Montreal R. R.
4-8½ g. 530 m. 100 lo. 2,682 cars.
B. A. Kimball, *Gen. Man*.......Concord,N.H.
W. H. Alexander, *Pur. Agt*.....Concord. N. H.
J. T. Gordon. *Supt. M. P & R.S*.Concord. N. H
G. A. Fergurson, *M. M*........Lakeport, N. H.
Conn. Riv. R. R. 4-8½ g. 130 m. 55 lo. 688 c.
(*See Boston & Maine.*)
Cooperstown & Charlotte Valley R. R.
4-8½ g. 25 m. 3 lo. 25 cars.
E. M. Harris. *G. M*.........Cooperstown. N. Y.
D. E. Siver, *Pur. Agt*.....Cooperstown, N. Y.
A. Gardner, *M. M*........ Cooperstown. N. Y.
Cornwall R. R., 4-8½ g. 31.1 m. 5 lo. 9 pass. c.
E. C. Freeman, *Gen. Man*.... ...Lebanon, Pa.
D. S. Hammond,*Supt.& Pur.Agt*.Lebanon,Pa.
A. J. Reed, *M. M*....... ....Lebanon, Pa.
Levi Blouch, *M. C. B* ....Lebanon, Pa.
Cornwall & Lebanon.
4-8½ g. 22 m. 10 lo. 17 p. 540 ft. cars.
A. D. Smith, *Gen. Supt. & P. A*Lebanon, Pa.
R. T. Spotten, *M. M*.............Lebanon, Pa.
Coudersport & Port Allegheny R. R.
4-8½g. 27 m. 3 lo. 80 cars.
B. A. McClure.*G. Supt.& P.A*.Coudersport, Pa
Cressen & Clearfield County and N. Y. Short Route.
(*See Pennsylvania Ry.*)
Crooked Creek R. R. & Coal Co.
4-8½ g. 24 m. 2 lo. 23 cars.
S. McClure, *Gen. Man* ....Lehigh. Ia.
Cumberland & Maurice River Ry.(*See Cent.Ry.of N.J.*)
Cumberland & Penn. R. R. 4-8½ g. 55 m.26 lo. 575 c.
Lewis M. Hamilton, *Gen Supt. & P. A.*,
Cumberland, Md
H. T. Bruck, *M. M*............Mt. Savage, Md.
Cumberland Valley R. R. 4-9 g.166 m. 34 lo. 764 cars.
J. F. Boyd, *Supt.& P.A*....Chambersburg, Pa.
J.Lawrence. *M. M*....... ..Chambersburg, Pa.
C. Wicke, *M. C. B*...... ...Chambersburg, Pa.

D

Danville & Western R. R. 3 g. 83 m. 5 lo. 70 c
A. B. Andrews, *Pres*... ....Raleigh, N. C.
G. K.Griggs, *Supt. & Pur. Agt*..Danville, Va.
W. T. Whittaker, *M. M*..........Danville, Va.
Dayton & Michigan R. R. (*See Cin., Ham. & Day.*
Delaware & Hudson R. R.
4-8½ g. 689 m. 331 lo. 18,275 cars.
H. G. Young, *2d V.-Pres*....... Albany, N. Y.
J. White Sprong, *Pur. Agt*.......Albany. N. Y.
R. C. Blackall, *Supt. Mach*.......Albany N. Y.
Susq. Div.: C. D. Hammond,*A.Supt*.Albany,N.Y.
J. R. Skinner, *M. C. B*.. .....Oneonta, N. Y.
H. C. Smith, *M. M*......... Oneonta. N. Y.
Sar.&C.Divs.:C.D.Hammond,*Supt*.Albany,N.Y.
J. L. Cory, *M. M*.... .... . Green Island, N. Y
Chr. Körner, *M. C. B*.. ...Green Island. N. Y
Pa. Div.: C. R. Manville, *Supt*.... Scranton, Pa.
C. F. Rettew. *M. M*.........Carbondale. Pa.
T. Orchard, *M. C. B*...... ... Carbondale,Pa.
Del. Lackawanna & Western R. R.
4-8½ g. 969 m. 605 lo. 33,715 cars.
Wm. F. Hallstead *Gen. Man*. ...Scranton, Pa.
W. D. Hager, *Pur. Agt*.. .....New York, N. Y.
D. Brown. *Mast. Mach*.......... .Scranton Pa.
Robt. McKenna *M. C. B*... . .Scranton, Pa.
Utica Div.: A. C. Salisbury, *Supt*....Utica, N. Y.
Thos. Thatcher, *M. M*........... .Utica, N. Y.
Morris & Essex Div.; Sussex.
A. Reasoner, *Supt*.. ....Hoboken, N. J.
W. H. Lewis, *M. M* ...... Kingsland, N. J.
J. W. Baker. *Mast. Car Rep*......Dover. N. J.
Oswego & Syracuse Div.
A. H. Schwarz, *Supt*...... Syracuse, N. Y.
L. Kistler, *M. M*.. . ...Syracuse, N. Y.
Syracuse, Binghamton & New York Div.
A. H. Schwarts, *Supt*.. ......Syracuse, N. Y
Lewis Kistler, *M. M*......... Syracuse, N. Y.
Div.: J. B. Marston, *Supt*...... .. Buffalo,N.Y.
F. B. Griffith. *M. M*.......... . ..Buffalo. N. Y.
Delaware River R. R. 4-8½ g. 20 m. 3 lo. 11 cars.
W. S. Conner, *Gen. Man*....Woodbury, N. J.
E. H. Green. *Supt. & P. A*..Pennsgrove, N. J.
J. B. Gilbert. *M. M*... .... Pennsgrove, N. J.
Denison & Washita Valley. 4—8½ 14 m. 1 lo. 119 c.
Thos. Fleming. *Supt*.... ....Denison, Tex.
Denver & Rio Grande Ry..
3 and 4-8½ g. 1,614.04 m. 293 lo. 7,220 c.
E. T. Jeffery, *Pres. & G. M*. ..... Denver,Col.
Henry Schlacks, *S. M. P*.... ... Denver, Col.
C. M. Hobbs, *Pur. Agt*. .....Denver, Col
Delaware, Susquehanna & Schuylkill.
4—9 g. 68 m. 29 lo. 1,513 cars.
D. Coxe. *Supt*.............. ......Drifton. Pa.
J. B. White, *P. A*. .... Drifton, Pa.
A. J. Beltz, *M, M. & M. C. B*.....Drifton, Pa.
Des Moines & Kansas City Ry.
3 g. 112 m.9 lo. 210 cars
John C. Newton,*G.M*............Des Moines, Ia
Theo. C. Sherwood. *S.&Pur.A*.Des Moines.Ia
E. Dawson, *M. M. & C. B*...... ...Osceola, Ia.
Des Moines, Northern & Western R. R.
4-8½ g. 156 m. 14 lo. 197 cars.
F. C. Hubbell, *Supt. & P. A*...Des Moines, Ia.
B. Reiley, *M. M. & M. C.B*....Des Moines, Ia.
Detroit & Mackinac R. R.
4-8½ g. 150 m. 20 lo. 330 c.
J. D. Hawks, *V.P. & Gen. Man*.Detroit, Mich.
G M.Crocker, *Pur. Agt* ....Detroit, Mich.
H. T. Thomas,*M.M.&M.C B*.Tawas City,Mich.
Det., Gr. H. & Mil. Ry. (*See Chi. & Gr. Trunk.*)
Det., Lansing & No'n and Saginaw Valley & St. Louis Rys. 4-8½ g. 378 m. 47 lo. 2,101 c.
Chas. M. Heald, *Gen. Man*........Detroit, Mich.
R. Wallace, *Pur. Agt*..............Detroit, Mich.
B. Haskell, *Supt.M.P*....Grand Rapids, Mich.
Walter. T. Rupert, *M. M*.......... Ionia. Mich.
Dominion Atlantic Ry. 4-8½ g 234 m. 21 lo. 387 c.
W. R. Campbell. *Gen. Man*.. Kentville, N S.
W. Yould, *M. M*. .... Kentville, N. S
W. Grierson, *M. C B*...... ..Kentville, N. S.
Duluth, Red Wing & Southern. 4—8½ 2 lo. 41 c.
L. F. Hubbard, *G. M*. .. ... Red Wing, Minn.
L. N. Stiles, *Supt. & P. A*...Red Wing: Minn,
H. D. McKay, *M. M* ......Red Wing, Minn.
J. Lyons, *M. C. B*.... ..... Red Wing, Minn.
Duluth & Iron Range R. R.
4-8½ g. 143 m. 48 l. 2,166 c.
J. L. Greatsinger, *Gen. Man. & Pur. Agt.*,
Duluth, Minn.
H. S. Bryan, *M. M. & M. C. B*.
Two Harbors, Minn.
Duluth, Miss'be&North'n.4-8½g.118.5m,25lo.1,280c.
D. M. Philbin, *Gen. Man*. ..... Duluth, Minn.
S. R. Payne, *Pur. Agt*...........Duluth, Minn.
A. F. Priest, *M. M*....... ......Duluth, Minn.
Duluth, South Shore & Atlantic Ry.
4-8½ g. 598 m.95 lo. 4,264 c.
W. F. Fitch, *Gen. Man* .....Marquette, Mich.
P. W. Brown, *Pur. Agt*........Marquette, Mich.
J. J. Conolly, *M. M*..........Marquette, Mich.
D. C. Mulvihill, *M. C. B*.....Marquette, Mich.
Duluth & Winnipeg R. R.
4-8½ g. 113 m. 6 lo. 71 cars.
W. F. Fitch. *Rec. & Gen.Man*.Duluth, Minn.
C. F. Ward, *M. M* ....La Prairie, Minn.
Dunkirk, Allegheny Valley & Pittsburgh R. R. N. Y. (Cen. & H. R. R. R Lesse)
4-8½ g. 91 m. 12 lo. 111 cars.
Chas. H. Ketcham, *Gen. Supt*. .Dunkirk, N. Y
Allen Bourn, *Pur. Agt* .. ....New York, N. Y.
W. G. Taber. *M. M. & C. B*.....Dunkirk. N. Y.

E

Eagles Mere Ry. Co. 3 g. 8 m. 3 lo. 23 cars.
Geo. W. Fox, *Supt*..............Sonestown, Pa.
East Alabama Ry. (*See Central of Ga.*
East & West R. R. of Ala 4-9 g. 117 m. 12 lo. 140 c.
Chas. P. Ball, *Man.&Pur A*.Cartersville, Ga.
B. F. Lowther, *M. M.&M.C.B*.Cedartown, Ga.
East Broad Top R. R. 3 g. 44 m. 9 lo.326 cars.
A. W. Greenwood, *Act. Supt., M. M. & P. A.*,
Rockhill Furnace, Pa.
Eastern Kentucky R. R. 4-9 g. 36 m. 4 lo. 51 c.
H. W. Bates. *Gen. Man.&Pur.A*.Greenup, Ky.
A. W. Crawford, *M. M*.... ...... Grayson, Ky.
Eastern Ry. Co. of Minnesota:
(*See Great Northern Ry.*)
East Tenn. & Western North Car. R. R
3 g. 34 m. 3 lo. 112 cars.
C. H. Nimson, *Gen. Supt*.....Cranberry, N. C.
W. Hahn, *Pur. Agt*...........Cranberry, N. C.
M. W. Lindamood. *M. M*..Johnson City,Tenn.
East Tennessee. Virginia & Georgia Ry.
(*See Southern Ry. Co.*
Elgin, Joliet & Eastern Ry.
4-8½ g. 176 m. 46 lo. 2,600 cars.
C. H Ackert, *Gen. Man* ....Joliet, Ill
R. A. Dugan, *Pur. Agt*..........Chicago, Ill.
John Horrigan, *M. M* ....Joliet, Ill.
E. T. Carlton, *M. C. B*.... ....Joliet, Ill
Elgin & Havelock Ry.
4-8¾ g. 28 m. 2 lo. 12 c.
J.D Chipman,*Man & P. Agt*. St Stephen, N.B.
A. H. Robinson, *G.S.& P. A*.Petitcodiac, N.B
W.W. Killam.*M.M.&M.C.B*.Petitcodiac,N.B.
Elmira, Cortland & Northern R. R.
4-8½ g. 140 m. 23 lo. 180 c.
Albert Allen, *Gen. Supt*... ....Cortland, N. Y.
M. A. Smith, *Pur. Agt*...... ....Elmira, N. Y.
Geo Richards, *M.M*...............Cortland, N.Y.
Erie & Huron Ry. 4-8½ g. 74 m. 5 l. 54 c.
J. J. Ross, *Gen Man. & P. A*.. .Chatham, Ont.
F. Stamelen *M. M*...............Chatham, Ont.
Erie & Pittsburgh R. R. (*See Penna. Co.*
Erie&Wyoming Valley R.R.4-8½g.68.55m.37 l. 186c.
Geo. B. Smith, *Supt*. ....Dunmore, Pa.
S. D. King, *M. C. B*... ....Dunmore, Pa.
D. E. Barton, *M. M*..............Dunmore, Pa.
Eureka & Palisade R. R. 3 g. 84 m.5 lo. 125 cars
D.J.Colton,*Gen.Supt&Pur.Agt*.Palisade, Nev.
E. W. Harris, *M. M*.... ....Palisade, Nev.
Eureka Springs Ry. 4-8½ g. 19 m. 2 lo. 8 cars.
Powell Clayton, *Gen. Man*.Eureka Springs,Ark.
C. H. Smith, *Pur. Agt*..........St. Louis, Mo.
J. B. Obenshain, *M. M*..Eureka Springs, Ark
Evansv. & Terre Haute and Evansville & Indianapolis R's. 4-8½g 315 m, 55lo. 3,900 c
H. C. Barlow.*P & Gen. Man*Evansville, Ind.
A. L. Sanger, *P. A* ....Evansville, Ind.
John Torrence, *S. M.P & R. S*.Evansville,Ind.

F

Fall Brook Ry. 4-8½ g. 257 m. 78 lo. 3,209 c.
Corning, Cowanesque & Antrim; Syracuse Geneva & Corning; Pine Creek; Geneva & Lyons.
G. R. Brown, *Gen. Supt*.... ....Corning, N. Y
W. H. Chaphe, *Pur. Agt*........Corning, N. Y.
Wm. A. Foster, *Supt. Machy*... Corning, N.Y
C. J. Butler, *M. C. B*.. ...... Corning. N. Y.
Farmville & Powhatan R. R. 3 g. 93 m. 5 lo. 168 c.
Jas. R. Werth, *Gen. Man*. .... Richmond, Va.
G. M. Wilson, *Pur. Agt*........Richmond, Va.
C. K. Bowles, *M. M* ....Chester, Va.
Findlay. Fort Wayne & Western R. R.
4-8½ g. 60 m. 5 lo. 90 cars.
C. M. Bisseil, *Gen. Man*....Fort Wayne, Ind.
C. H. Roser.*Pur. Agt*......Fort Wayne, Ind.
A. W Stadler, *M. M*.......Fort Wayne, Ind.
Fitchburg R. R., 4-8½ g. 458.43 m. 204 lo. 6,619 c
W. D. Ewing, *Gen. Supt*.........Boston, Mass
Geo. J. Fisher. *Pur.Agt*.........Boston, Mass.
J. Medway, *Supt M.P*...........Boston, Mass.
J. W. Marden. *Supt. Car Dept*..Boston. Mass.
S. W. Simonds. Jr., *M. M*......Boston, Mass.
Flint & Pere Marq.
3 & 4-8½ g. 777 m. 103 lo. 3,617 cars.
Stanford T. Crapo, *Gen. Man.*,
J. H. Simpson, *Asst.G.M*.Saginaw,E.S.,Mich.
H. D. Norris, *Pur. Agt*. .Saginaw, E. S., Mich.
T.J.Hatswell.*MM.&M C.B*.Sagin'w,E.S.,Mich.
Florida Midland Ry. 4-8½ g. 45 m. 2 lo. 6 cars.
H. S. Chubb, *Rec*..... . .....Kissimmee, Fla
J. M. Booth, *Supt. & P. A*..Kissimmee, Fla.
Florida, Central & Peninsular R. R.
4-9 g. 933 m. 73 lo. 2,083 cars.
D. E. Maxwell,*G.M.& Pur.A*.Jacksonv'le, Fla
E. Burton, *M. M*........ .....Fernandina, Fla.
J. J. Bassenger, *M. C. B*.....Fernandina, Fla.
Florida Southern Ry. (*See Plant-System*).
Fonda, Johnst'n & Gloversv. 4-8½ g. 26 m.9 lo. 40 c.
R.T.McKeever,*G.S.&Pur Agt*.Gloversville,N.Y.
F.E. Driscole,*M.M.& M.C.B*.Gloversville,N.Y.
Ft. Worth & Denver City Ry.
4-8½ g. 469 m. 32 l. 1,016 cars.
Morgan Jones, *Receiver*....Fort Worth, Tex.
E. W. Hayes. *Supt. M. P*...Fort Worth, Tex.
Fort Worth & Rio Grande Ry. 4-8½ g.147m.10 l.115 c.
John Hornby,*Pres.,G S.&P.A*.Fort Worth,Tex.
H.D.Galbraith, *M.M.&M.C.B*.Ft. Worth, Tex
Franklin & Megantic R. R. 2 g. 37 m. 2 lo. 50 c.
V B. Mead. *Pres. & Gen. Man*..Boston, Mass
P. H. Stubbs, *Pur. Agt*.........Strong, Mass
W. S. Heath, *M. M*.......... .... Salem, Me.
Fremont, Elkhorn & Mo.Val.R.R. (*See SiouxC.&Pac.*)
Fulton County N. G. Ry. 3 g. 61 m. 5 lo. 190 cars
S. H. Mallory, *Gen. Man* ....Chariton, Ia.
A. C. Atherton *Gen.Supt.& P.Agt*..Lewiston.

G

Gal., Harrisburg & San Antonio Ry. (*See So. Pac*
Galveston, La Port & Houston Ry.
4-8½ g, 42 m. 4 l. 28 c.
C. H. Hammett, *Gen. Man*...Houston, Tex.
George's Creek & Cumberland R. R.
4-9 g. 33 m. 9 lo. 1,100 cars.
J. A. Millholland, *G.M.&P.A*. Cumberland, Md.
Thos. McCann, *M. M.&M.C.B*.Cumberland,Md.
Georgia R. R 4-9 g. 303 m. 56 lo. 1,148 cars.
Thos. K. Scott, *G.M. & P. A*.....Augusta, Ga
John S. Cook, *M. M*................Augusta. Ga
E. S. Scheetz, *M. C. B*. ....Augusta. Ga.
Georgia.Midland & Gulf R.R.4-9 g. 100 m. 8 l. 269c.
John F. Flournoy. *Receiver*.. Columbus, Ga.
C. W.Chears, *G. Man.&P.Agt*.Columbus, Ga.
J. D. McPhail, *M. M. & C. B*... Columbus. Ga
Georgia Southern & Florida R. R.
4-8½ g. 285 m. 29 lo. 967 cars.
W. B. Sparks, *Receiver*..... .. ....Macon, Ga.
J. Lane, *Gen Man. & Purch. Agt*..Macon, Ga
Geo. D. Harris, *M. M. & M. C. B*.Macon. Ga
Gettysburg & Harrisburg R.R. (*See Phila. & Reading R. R.*)
Grafton & Upton R. R.. 4-8¼g. 16¾ m.3 lo. 7 c.
E. P. Usher, *Gen. Man*........Grafton, Mass.
F. W Morse, *G. Supt. & P. A* Grafton, Mass.
Grand Rapids & Indiana. 4-9 g.581 m. 73lo. 3,229 c.
J. H. P. Hughart, *G. M*..Grand Rapids, Mich.
W. R. Shelby, *Pur. Agt*....Grand Rapids, Mich.
J. E. Keegan, *M. M*......Grand Rapids. Mich.
Grand Tower & Carbondale. (*See Chicago & Tex.*
Grand Trunk Ry. 4-8½ g.3,512 m.795 lo. 23,547 c.
L. J. Seargeant. *Gen. Man* .... Montreal, Can.
Jno. Taylor, *Gen. Storekeeper*...Montreal, Can.
Herbert Wallis. *Mech. Supt*.. ..Montreal, Can.
Wm. McWood,*A.M. S. Car Dept*.Montreal, Can.
F. L. Wanklyn,*A.M.S.Lo.Works*.Montreal,Can.
J. D. Barnett, *A.M.S.Lo.Wks*.Stratford,Ont,
J. W. Harkom, *A.M. S. C. Div*...Toronto, Ont
Great Northern Ry. line:
Great Northern Ry. Co.; Montana Central Ry. Co.; Willmar & Sioux Falls Ry. Co ; Duluth, Watertown & Pac. Ry. Co.; Pacific Coast lines. Eastern Ry. of Minn.
4-8½ g. 4,488 m. 418 lo. 14,323 cars.
Chas. H. Warren, *Gen. Man*..St. Paul, Minn.
J. W. Blabon, *Pur. Agt*.......St. Paul, Minn.
J. O. Pattee, *Supt. M P*. ...St. Paul, Minn.
Green Bay, Winona & St. Paul R, R.
4-8½ g 250 m, 22 lo, 464 cars.
S. W. Champion, *G. M. & P.A*.Green Bay,Wis
A. Fenwick, *M. M*...... ......Green Bay, Wis.
Greenfield & Northern, 4-8½ 36 m, 4 lo. 7 cars.
T. A. Miller, *Gen. Man*.. ....Aurora, Mo.
Green Pond, Walterboro & Branchville Ry.
4-9 g, 14 m, 1 lo, 2 cars.
C. S. Gadsden, *Supt*.. ... Charleston, S. C.
W. F. Loughman, *Pur. Agt*.New York, N. Y.
Wm. Rutherford,*Supt.M.P&E*.Savannah,Ga.
G. M. D. Riley. *M M*.. .... Savannah, Ga.
Green Ridge R. R. of Maryland.
3 g. 26 m. 2 lo. 20 cars.
F. Mertens, *Pres. & P. A* Cumberland, Md.
Greenwich & Johnsonville Ry. 4-8½ g. 15m, 2lo, 5c.
J. H.Thompson,*G.M..G.S.&P.A*Gr'nwich,N.Y.
Gulf & Chicago R. R. 3 g, 63m. 5 lo. 45 c.
C. L. Harris, *Gen Man.,G.S.&P A*.Ripley,Miss.
J. P. Dugger, *M. M*.......... ....Ripley, Miss.
Jno. Reed, *M, C. B*.... .... Ripley. Miss.
Gulf, Col. & Sante Fe Ry. (*See A., T. & S. F Ry.*)
Gulf, W'n Texas & Pac. Ry. (*See Southern Pacific.*)

H

Hannibal & St. Jo. R. R. 4-8½g.295m,78lo,1,540c.
W. C. Brown, *Gen. Man* ... ..St. Joseph, Mo.
Geo. Hargreaves, *Gen. Pur. Agt*.Chicago, Ill,
N. J. Paradise. *M. M*. Lines E. of Brookfield,
Hannibal, Mo.
F. A Chase, *M. M*. Lines W. of Brookfield,
St. Joseph, Mo.
I. N. Wilbur, *Div. M. M*......Brookfield, Mo.
G. M. Shryock, *M. C. B*.........Hannibal, Mo.
Housatonic R. R. (*See N. Y., N. H. & H R. R.*)
Houston&Tex.Cen.Ry. 4-8½g. 510 m,114 lo.2,661c.
G. A. Quinlan. *V P.&Gen. Man* Houston,Tex
Geo. Howes, *Pur. Agt*.......New York, N. Y.
S. R. Tuggle,*Supt.M.P &Ma*...Houston,Tex.
C. H. Burnes, *M.M*........ . . Houston. Tex.
James McGee, *M. C. B*....... Houston, Tex.
Houston, E & W.Tex. Ry.
4-8½ g, 232 m, 18 lo. 500 cars.
M. G. Howe, *V. P. & Gen:Man*..Houston, Tex.
A. S. Grant, *M.M & M.C. B*... Houston, Tex.
N. S. Meldrum, *Pur. Agt*........Houston, Tex.
Humeston & Shenandoah R. R.
4-8½ g, 113 m, 18 lo, 80 cars.
E.C. Murphy,*Gen.Man.,Gen.Supt. & Pur.Agt*
Clarinda. Ia.
G. Knapp, *M. M. & C. B* ..... Shenandoah, Ia.
Huntingdon & Br. Top Mt. R. R.
4-9 g, 63 m. 23 lo. 2,714 c.
Geo. F. Gage. *Gen. Man*.....Huntingdon, Pa.
Samuel B. Knight, *Pur. Agt*..Philadelphia,Pa.
C. R. Yohn, *M. M*................. Saxton, Pa.
Hutchinson & Southern Ry. 4-8½ g, 82 m. 3 l, 26 c.
Byron Roberts. *Rec* .... Hutchinson, Kan.

I

Illinois Central R.R. 4-8½g.2,888m,610 lo.16,632c.
A. W. Sullivan, *Gen. Supt* ..... .Chicago, Ill.
C. A. Beck, *Pur. Agt*..... ....Chicago, Ill.
Wm. Renshaw. *Supt. of Mach*....Chicago, Ill
J. J. Casey, *Asst. Supt, M. P*...Chicago, Ill.
Wm. Apps, *M. C. B*...............Chicago, Ill
(1) Northern Lines:
J. C. Hartigan, *Asst. G. Supt* . Chicago, Ill.
Cherokee Div.: C. K. Dixon, *Supt*.Cherokee, Ia.
T. W. Place, *M. M*.............Waterloo, Ia.
Chic. Div.: H. Baker. *Supt*........Centralia, Ill.
J. H. Pollard, *M. M*..... .. ...Centralia, Ill.
Spring Div.:
D. S. Bailey, *Supt*...... .... Clinton, Ill.
J. S. Chambers, *M. M*............Clinton, Ill.
Ia. Lines.
Thomas W. Place, *M. M*......Waterloo, Ia.
Dubuque & Freeport Div.:
F. B. Harriman, *Supt*. ....Dubuque, Ia.
T. W. Place, *M. M*..............Waterloo, Ia.
E. O. Dana *M. M*... ....Freeport. Ill.
(2) So. Lines: M. Gilleas, *Asst.G.S*.Memphis,Tenn.
La. Div.: O. M. Dunn, *Supt*....New Orleans, La.
T. C. Losey, *M. M*. .....McComb City, Miss.
Miss. Div.: N. D. Wiggins, *Supt*.Jackson, Tenn.
W. S. Hessman, *M. M*...Water Valley, Miss.
Memphis Div.: J. B. Kemp, *Supt*.Memphis,Tenn.
J. J. O'Rourke, *M. M*........Memphis, Tenn.
Indiana & Illinois Southern R.R. 4-9g,91m.6 l,109c.
P. H. Blue, *Gen Man. & P. Agt*.Sullivan,Ind.
M. E. Hotchkiss, *M. M*.... ......Palestine. Ill.
Indiana. Illinois & Iowa R.R.
4-8½ g, 209.02 m, 24 l. 178 c.
T. P. Shonts, *Gen,Man.& Pur.Agt*.Chicago,Ill
L. H. Miller, *M. M. & M. C. B*.Kankakee, Ill.
Indianapolis & St. Louis R. R, (*See C., C.C &St.L.*
Indianapolis& Vincennes R R. (*See Penn. Co.*
Indiana, Decatur & Western Ry.
4-8½ g, 153 m, 18 lo, 762 c
R. B. F. Pierce. *Gen. Man*..Indianapolis, Ind.
C. B. McVay, *Pur. Agt*......Indianapolis, Ind.
J. McKenna, *M. M*......... Indianapolis, Ind.
Intercolonial Ry. of Canada.
4-8½ g, 1,142 m. 206 lo, 6,844 c.
David Pottinger. *Gen. Man*....Moncton, N. B
T. V. Cooke, *Pur. Agt* ......Moncton, N. B.
F. R. F. Brown. *Mech. Supt*..Moncton, N. B.
D. White, *Gen. Car Foreman*..Moncton, N. B
International & Great Northern Ry.
4-8½ g, 825 m, 109 lo. 1,788 cars.
T. M. Campbell, *Gen. Man*.....Palestine, Tex.
F. Hufsmith, *M M*.......... Palestine, Tex.
W. E. Williams, *Pur. Agt*.... Palestine, Tex.
Interoceanic Ry. 3 g, 519 m, 64 lo 964 cars.
E. W. Jackson, *Gen. Man* ...Texcoco, Mex.
C. A. Crail, *Pur Agt*....... .... Texcoco, Mex.
E V Sedgwick,*Supt.M.P*.City of Mexico,Mex.
E. M. Ruth, *M. C. B*........ Texcoco, Mex.
Iowa Central Ry. 4-8½ g, 498 m, 66 lo, 2,255 cars.
Col. L. M. Martin, *G. M*....Marshalltown, Ia.
S. M. Rogers, *Pur. Agt*....Marshalltown, Ia.
B. Reiley. *M. M*...... ....Marshalltown, Ia.
E. E. Carver, *M. C. B*.....Marshalltown, Ia.
Iron Ry. 4-8½ g, 20 m, 4 lo, 214 cars.
C. C. Clarke, *Gen. Man*...... ......Ironton, O.
B. S. J. Garvey, *Pur. Agt*.........Ironton, O.
G. A. Meyers, *M. M*................Ironton, O.
B. Martin, *M. C. B*.... ....Ironton, O.
Irondale, Bancroft & Otawa Ry.
4-8½ g, 30 m, 2 lo, 16 cars.
Chas. J. Pusey, *Gen. Man*......Irondale, Ont.
Ironton R, R. 4-8½ g. 12 m. 2 lo. 9 c.
W. Andrews, *Gen. Supt*....... Allentown, Pa.
W. M. Kuhns, *Pur. Agt*.......Allentown, Pa.
S. R. Thomas, *M. M*......Hokendauqua, Pa

J

Jacksonville, St. Augustine & Indian River Ry., operating Atlantic & Western Ry. of Florida.
4-9 g. 339 m. 27 lo. 150 cars.
R. T. Goff, *Supt*....... ...St. Augustine, Fla.
J. D. Wright, *Pur. Agt*...... New York, N. Y.
Geo. A. Miller, *M. M*.......St. Augustine, Fla.
Jacksonville, Tampa & Key West Ry.
4-9 g. 200 m. 26 lo. 510 cars.
Joseph H. Durkee, *Receiver*.Jacksonville,Fla.
W. B. Coffin, *G. S & P. A*.Jacksonville, Fla.
F. E. Tubbs, *M. M* ....Palatka, Fla.
Jeffersonv., Mad. & Ind. R.R. (*P.,C.,C. & St. L. Ry.*

K

Kanawha & Michigan Ry. ..4-9 g. 168 m. 15 l. 600 c.
(*See Ohio Central lines.*)
Kansas City, St. Joseph & Council Bluffs.
4-8½ g. 308 m. 44 lo. 1,042 c.
W. C. Brown, *Gen. Man*..... St. Joseph, Mo.
Geo. Hargreaves, *Pur. Agt*..... Chicago, Ill.
F. A Chase, *M. M*.. ....St. Joseph, Mo.
T. Aylesbury, *M. C. B*........St. Joseph. Mo.
Kansas City & Independence Rapid Transit Ry
4-8½ g. 23 m. 8 lo. 38 cars.
C F. Holmes, *Gen. Man*......Kansas City, Mo.
W. A. Saterlee, *Pur. Agt*....Kansas City, Mo.
C. Wiseman. *M M. & M.C.B*.Kansas City, Mo.
Kansas City, Osceola & Southern Ry.
4-8½ g. 140 m. 10 lo. 281 c.
B. S. Josselyn, *G. M. Supt. & P.A*.Clinton, Mo
Leslie McLachlin, *M. M.& M.C.B*.Clinton, Mo
Kansas City, Fort Scott & Memphis, Kansas City, Clinton & Springfield and Current River Rys.
4-8½ g. 915 m. 186 l. 7,6?5 c.
Geo. H. Nettleton, *Gen. Man*Kansas City,Mo.
H. P Jacques, *Pur. Agt*....Kansas City. Mo.
W. A. Nettleton, *S.M.P.&M.*,Kansas City, Mo.
A. N. Monteer, *M. C. B*.......Springfield, Mo.
Jas. Bissett, *M. M* ....Springfield, Mo.
Kansas City Memphis & Birmingham R. R.
4 8½ g. 276 m. 41 lo. 1,798 c.
Geo. H. Nettleton, *Gen. Man*...Kan. City, Mo.
H. P. Jacques, *Pur. Agt*....Kansas City. Mo.
J. S. McCrum,*Supt.M.P&M*.Kansas City, Mo.
R. H. Briggs, *M. M*..........Memphis, Tenn.
Kansas City, Pittsburgh & Gulf R. R.
4 ft. 8½ in. g. 230 m. 14.1. 600 cars.
E. L.Martin. *P. & Gen. Man* Kansas City, Mo.
W. K. Morley, *G. Supt. & Pur. Agt.*,
Kansas City. Mo.
T. D. Woodlawn, *M. M. & M. C. B*.
Pittsburgh, Kan.
Kansas City, Watkins & Gulf Ry.
4-8½ g. 100 m. 9 lo. 239 cars.
F. S. Hammond, *Gen, Man*..Lake Charles, La.
J. B. Watkins, *Pur. Agt*..Lake Charles, La.
J. C.Ramsey,*M.M.&M.C.B*.Lake Charles, La.
Kent Northern Ry. 4-8½ g 45 m. 4 lo. 31 cars.
W. Brown, *Gen. Man*...... . Richibucto, N. B.
T. Murray, *Supt. & M. C. B*.Richibucto, N. B.
E. Animaux, *M. M*...... ....Richibucto, N. B.
Kentucky & Indiana Bridge Co.
4-8½ g. 16 m. 5 lo. 17 cars.
G. MacLeod, *G. M*...............Louisville, Ky.
J. Newhouse, *M.M*............ Louisville, Ky.
W. F. Davis, *M. C. B*..........Louisville, Ky.
Kentucky Midland Ry. 4-8½ g. 40 m. 4 l. 35 c.
Geo. B. Harper, *Rec.,S.&P.A*. Frankfort, Ky.
M. Horton, *M. M*. ....Frankfort, Ky.
Kentucky & South Atlantic Ry. (*See Chesapeake & Ohio Ry. Co.*)
Kentucky Central Ry. (Operated by L. & N. R. R.)
Keokuk & Western R. R. 4-8½ g. 148 m. 14 l. 955 c.
A. C. Goodrich, *G. M. & Pur. Agt*.Keokuk, Ia.
W. Augustus, *M. M. & M. C. B*.Centerville, Ia.
Kickapoo Valley & Northern Ry. Co.
4-8½ g. 34 m. 2 lo. 14 cars.
W. H. Thomson. *G. M.& P.A*. Wauzeka,Wis.
Kings Co. Elevated Ry. 4-8½ g. 9 m. 44 lo. 145 c.
W. T. Goundie, *Gen. Man., Supt. & Pur. Ag.*,
Brooklyn, N. Y
W. F. Thompson. *M, M*........Brooklyn, N. Y
W. S. Sutton, *M. C. B*....... Brooklyn, N. Y.
Kingston & Pembroke Ry.4-8½ g.113 m. 9 lo. 198 c.
Jos. Bawden, *Receiver*.... .. .Kingston, Ont.
B. W. Folger, *Gen.Man*. ....Kingston,Ont.
J. Whitsbread, *Pur. Agt*......Kingston, Ont.
F. Clark, *M. M*...... ....Kingston, Ont.
D. Nesbith, *M. C. B*...........Kingston, Ont.
Knoxville & Augusta R.R, 4-8½ g. 16m 2 lo. 30cars.
W.P.Hood,*Gen. Supt.& P.A*.Knoxville,Tenn.
John L. Bradford, *M. M*. . Knoxville, Tenn.
W. C. Bruce, *M. C. B*........Knoxville, Tenn.
Knoxville, Cumberland Gap & Louisville,
4-9 g. 81.80 m, 12 lo. 450 cars.
L. F. Wynne, *Supt*........ .Knoxville, Tenn.
H. G. Fraser, *Pur. Agt*....Knoxville, Tenn.
B. J. Sitton, *M.M*........... Middlesboro, Ky.
H. Clark, *M. C. B*..........Knoxville, Tenn.

L

Lake Champlain & Moriah Ry.
4-8½ g. 16 m. 9 lo. 326 cars.
A. E.Tower,*G. M. & P. A*.Poughkeepsie, N. Y.
C. P. Morrison, *M. M*......Port Henry, N. Y.
R. C. Smith, *M. C. B*........Port Henry, N. Y.

You make a mistake if you order any M.C.B. Couplers or renew any contracts until you have examined and tried the Tower

which is going into use more rapidly than any other Coupler ever did.

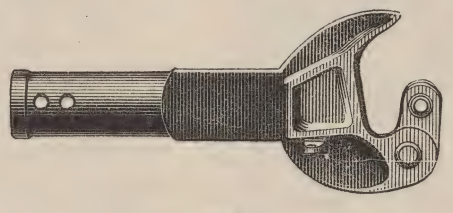
RAILWAY DEPARTMENT OF

THE NATIONAL MALLEABLE CASTINGS COMPANY,

OLD COLONY BUILDING, CHICAGO.

WORKS AT CHICAGO, CLEVELAND, TOLEDO, INDIANAPOLIS.

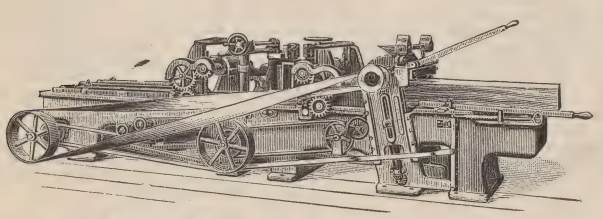
THE JANNEY FREIGHT CAR COUPLER



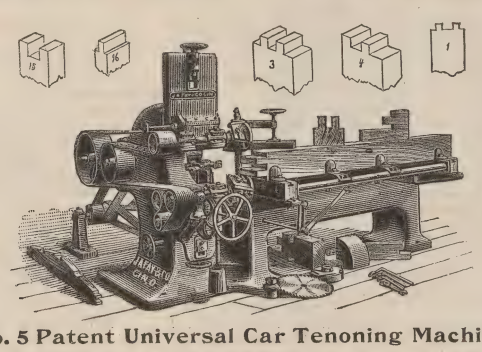
THE McCONWAY & TORLEY COMPANY

W. McCONWAY—PRESIDENT.

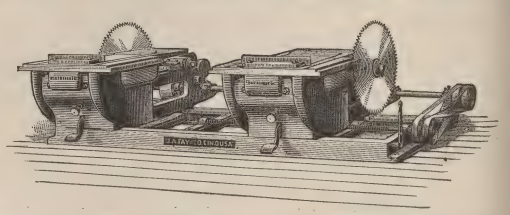
48th ST. & A.V.R'Y.—PITTSBURGH, PA.



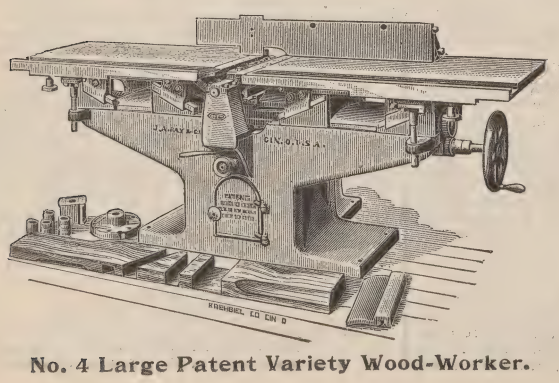
No. 2 Extra Heavy Large Car Sill and Timber Dressing Machine.



No. 5 Patent Universal Car Tenoning Machine.



No. 3 Automatic Patent Double Cutting-Off Machine.



No. 4 Large Patent Variety Wood-Worker.

WOOD REDUCING MACHINERY

FOR CAR BUILDERS.

HIGHEST HONORS WHEREVER EXHIBITED.

PLANS, SPECIFICATIONS AND ESTIMATES ON APPLICATION.

J. A. FAY & CO.

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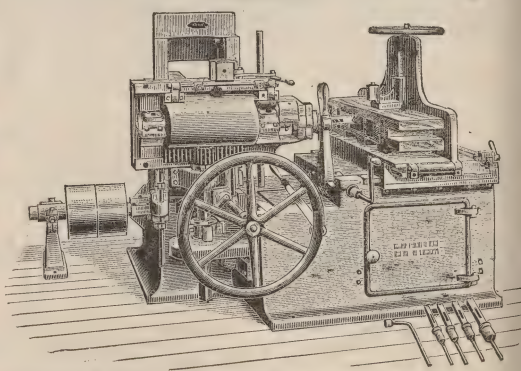

No. 3 Automatic Hollow Chisel Mortising and Boring Machine.

Lake Erie, Alliance & So'n Ry. 4-8½g. 36m. 1 l. 74c.
E. E. Scranton, Rec., M.&P.Agt....Alliance, O
C. P. Finch, M. C. Repairer..... Alliance, O.
Lake Erie & Detroit River Rd.
4-8½ g. 108 m. 7 lo. 218 c.
E. C. Walker, Man. Dir.... Walkerville, Ont.
Alex. Leslie, Pur. Agt .....Walkerville, Ont.
S. Austin, Mech. Supt......Walkerville, Ont.
Lake Erie & West'n R. R. and Ft. Wayne, Cin. & Louisville Ry. 4-8½ g. 718 m. 120 lo. 5,719 c.
Geo. L Bradbury, V.P.&G.M. Indianapolis, Ind.
T. H. Perry, Pur. Agt Indianapolis, Ind.
P. Reilly, Supt Equipment ..... Lima, O.
Lake Shore & Michigan So'n Ry.
4-8½ g. 1,448 m. 591 lo. 21,582 cars
D. W. Caldwell, Pres.&G. Man. Cleveland, O.
Chas. B. Couch, Pur. Agt........Cleveland, O.
G. W. Stevens, Supt. M. P. .....Cleveland, O.
A. M. Waitt, Gen. M. C. B......Cleveland, O.
A. A Bradeen, M. M............ Cleveland, O.
East'n Div.: T. W. Niles, Supt.. Buffalo, N. Y.
E. E. Elden, M. M.............Buffalo, N. Y.
A. C Robson, M. C. B.......Buffalo. N. Y.
Geo. N. Dow, M. C. B ....Cleveland, O
Frank. Div.: A. H. Smith, Supt. Youngstown. O.
Toledo Div.: J. K. Russell, Supt .Cleveland, O.
J. O. Bradeen, M M.... .....Norwalk, O.
J. R. Reniff, M. C. B...... ...Norwalk, O.
Mich. Divs.: L. E. Johnson, Supt ... Toledo, O.
F. O. Bray, M. C. B... ....Adrian, Mich.
Det. Brs.: S S. Hand, Supt.......Detroit, Mich.
Lansing, Ypsilanti & Ft. Wayne Branches:
H. A. Worcester, Supt ..Hillsdale, Mich.
Western Div.: A. B. Newell, Supt...Chicago, Il.
W. L. Gilmore, M. M..... .....Elkhart, Ind.
T. Fildes, M. C. B.... ..... .Englewood, Ill.
Lakeside & Marblehead Ry. 4-8½g 10 m. 2 lo. 11 c.
C. E. Gowen, G. M. & P. A.....Cleveland, O.
W. M. Harsh, G. S... ....Cleveland, O.
Lancaster, Oxford & Southern R.R. 3g, 20m. 2 l. 23c,
A. M. Nevin, Gen. Man. & P. A...Oxford, Pa.
Lebanon Springs R. R. 4-8½ g. 58 m. 4 lo. 18 cars.
Wm. V. Reynolds, Rec........Bennington, Vt.
E.D. Bennett Supt.&Pur.Agt. Bennington, Vt.
S. Hawley, Act.M.M.& M.C.B. Chatham, N.Y.
Lehigh & Hudson River Ry. 4-8½g. 90m. 23lo. 755c.
Grinnell Burt. Gen. Man......Warwick, N. Y.
E. M. Reynolds, Pur. Agt....Warwick, N. Y.
H. M. Missimer, M. M.... ....Warwick, N. Y.
Lehigh & Lackawanna R.R. (See Cent. R.R. of N.J.)
Lehigh Valley R. R. 4-8½g. 2,441m. 662lo. 54,400c.
R. H. Wilbur, Gen. Supt.. So. Bethlehem, Pa.
Samuel Higgins, Supt.M.P. So. Bethlehem, Pa.
W. C. Alderson. Pur. Agt.. Philadelphia, Pa.
J. I. Kinsey, M. M.... ....So. Easton, Pa.
Phillip Wallis, M. M.... ......Hazleton, Pa.
F. Roth, M. M... ....Wilkes-Barre, Pa.
J. N. Weaver, M. M...............Sayre, Pa.
John Campbell, M. M .. ..Buffalo, N. Y.
John S. Lentz, Supt. Car Dept. Packerton, Pa.
Lexington & Eastern Ry. Co.
4-9 g. 94 m. 8 lo. 373 cars.
J. D. Livingston, G.M.&P.A., Lexington, Ky.
Geo. F. Foster, M. M.&M.C.B., Lexington, Ky.
Ligonier Valley R. R. 4-9 g. 11 m. 3 l. 19 cars.
Thos. A. Mellon, Gen. Man..... Ligonier, Pa.
Geo. Senft. S.P.A., M.M.& M.C.B.. Ligonier, Pa
Little Miami Ry. (See P., C. & S. L.
Little Rock & Fort Smith. (See Mo Pac.
Lit. Rock & Memphis R.R. 4-8¾g. 135m. 16lo. 303c.
R. Fink, G. M. & P. A.....Little Rock, Ark.
C. Robkin, M. M.. ....Argenta, Ark
A. Waldo, M. C. B................Argenta, Ark
Little Saw Mill Run R. R 4-8½ g. 3 m. 4 lo. 178c.
R. W. Jones, Gen. Man........Pittsburgh, Pa.
C. Schoeneman, Pur. Agt.....Pittsburgh, Pa.
Alf. Easton, M. M...... ..... Banksville, Pa.
Jas. Easton, M. C. B.... ..Banksville, Pa.
Litchfield, Carrollton & Western Ry. Co.
4-8½ g. 58 m. 2 l. 36 cars.
C. H Bosworth, Receiver......Carlinville, Ill,
Henry S. Carrall, Gen. Man... Carlinville, Ill
F. C. Dodds, Pur. Agt........Springfield, Ill.
Geo. W. Lipscomb, M. M......Carrollton, Ill.
Live Oak & Gulf Ry. 4-8½ g, 20 m, 1 lo., 2 cars.
C. J. McGehee, Gen. Man.....Live Oak, Fla.
Long Island R. R. 4 8½ g. 360 m. 148 lo. 1,740 cars.
E. R. Reynolds, Gen. Man. Long Island City, N.Y.
G. L. Hubbell, Pur. Agt. Long Island City, N.Y.
S F. Prince, Jr., S.M.P.& E. Morris Park, N.Y
Los Angeles Terminal Ry.
4-8½ g. 51 m. 8 lo. 171 cars.
T. B. Burnett. P. A. & G.M. Los Angeles, Cal.
T. R. Shanks, M.M.&M.C.B. Los Angeles, Cal.
Louisville & Nashville R. R.
4-9 g. 3,158 m. 548 lo. 19,951 cars.
J. G. Metcalfe, Gen. Man.... .Louisville, Ky.
P. P. Huston, Pur. Agt..........Louisville, Ky.
P. Leeds, Supt. Mach...........Louisville, Ky.
A. Beckert, Gen. M. M... .New Decatur, Ala.
Kent. Cen. Div.: L. Hood, Supt...Cincinnati, O.
Wm. Adair, M M.................Covington, Ky.
Louisv., Cin. & Lex. Div.:
C. A. Davies, Supt.... ...... E. Louisville, Ky.
Wm. Adair, M. M.............E. Louisville, Ky.
Lou. Div.: W. S. Martin, Supt.. .Louisville, Ky.
J. G. Clifford, M. M............Louisville, Ky.
Nash. Div: J. Geddes, Supt....Nashville, Tenn.
R. Moran, M. M........ ..Bowling Green, Ky.
Mob. & M.: Div. Pens. & Sel. R. Rs.:
J. J. McKinney, Supt.. .Montgomery, Ala.
H. Minto, M. M......... ....Mobile, Ala.
Pensacola Div.:
E. O. Saltmarsh, Supt. ..... Pensacola, Fla.
C. F. Giles, M. M...............Pensacola, Fla
Memp.LineDiv.: L.S.Robertson, S.Memphis, Tenn.
J. V. Slusser, M. M .. ..Memphis, Tenn.
St. L. & Hend. Div:
B. F. Dickson, Supt..... ...Evansville, Ind.
Thos. Walsh, M. M....... .....Howell, Ind.
Louisville, Evansville & St. L. Consolidated R. R.
5 ft. 9 in. g. 378.78 m. 65 lo. 2,631cars.
E. O. Hopkins, Gen. Man.....Evansville, Ind.
H. W. Matters, Pur. Agt........Princeton. Ind.
J. K. Lape, Supt. M.P.& M . Princeton, Ind.
Louisville, New Albany & Corydon.
4-8½ g. 11 m. 2 l. 3 cars.
M. J. O'Connor, Gen Man......Corydon, Ind.
G. W. Briffett, S.P.A.&M.M ..Corydon, Ind.
Louisville, New Albany & Chicago Ry.
4-8½ g. 537 1/10 m. 97 lo. 6,077 cars.
W.H.McDoel, V.Pres.& Gen. Man. Chicago, Ill.
J. H. Craig, Auditor & Pur. Agt. Chicago, Ill.
Henry Watkeys, M. M......New Albany, Ind.
Chas. Collier, M. C. B.......New Albany, Ind.
Louisville, New Orleans & Tex. Ry. (See Ill. Central)
Louisville, St. Louis & Texas Ry.
4-9 g. 186 m. 15 lo. 768 cars.
Attilla Cox, Rec........ ....Louisville, Ky.
A. M. McCracken, Gen. Sept... Louisville, Ky.
C. P. Bush, Pur. Agt........ ...Louisville, Ky.
F. J. Ferry, M. M.......... .Cloverport, Ky.

M

Macon & Northern. 4-8½ g. 107 m. 6 lo. 460 cars.
Col. Wm. H. Ross, Receiver.. ...Macon, Ga.
A. H. Porter, Supt ....Macon, Ga.
W. A. Carey, M. M. & M. C.B....Macon, Ga.
Macon, Dublin & Savannah.
4-8½ 54 m. 2 lo. 47 cars.
J. T. Wright, Gen. Man..........Macon, Ga.
P. Hough, Pur. Agt...............Macon, Ga.
Maine Central R. R. 4-8½ g. 821 m. 156 lo. 3,549 c.
Payson Tucker, V.-Pres.& G.M.. Portland. Me.
A. S. Bosworth, Supply Agt....Portland, Me.
Amos Pilsbury, Supt. M. P . .Portland, Me.
John Ellis, M. M...............Waterville, Me.
C. H. Kenison, M. C. B..........Portland, Me.
Manhattan Ry. 4-8½ g 36 m. 381 lo. 1,116 c.
Frank K. Hain, V.-Pres., G. M. & P. A., New York, N. Y.
T. W. Peeples, M. M..........New York, N.Y.
H. A. Webster, M. C. B ......New York. N.Y.
Manistee & Luther Ry. 3 g. 60 m. 6 lo. 240 cars.
R. G. Peters, Gen. Man.... ...Eastlake, Mich.
H. W. Carey, Pur. Agt.. .....Eastlake, Mich.
T. J. Peach, M. M. & M. C. B. Eastlake, Mich,
Manistee & North East'n Ry. 4-8½g. 108m. 9lo. 295c.
Edward Buckley, Gen. Man...Manistee, Mich.
J. M. Peterson, Pur. Agt......Manistee, Mich.
Wm. H. Nuttall, S.M.P.&R S.. Manistee, Mich.
E. N. Wiest, M. C. B.........Manistee. Mich.
Marieopa & Phœnix R. R. 4-8½ g. 35 m. 3 l. 20 c.
C. S. Masten, Gen. Man .... .Phœnix, Ariz.
F. I. Kendall, Pur. Agt....San Francisco, Cal.
M. S. Webb, M. M. & M. C. B.. Phœnix, Ariz.
Marietta & North Georgia R. R
4-9 g. and 3 ft. g. 231 m. 231 m. 18 lo. 250 c.
J. B Glover. Receiver...........Marietta, Ga.
J. B. Glover, Jr., S. M. P........Marietta, Ga.
Mason & Oceana Ry. 3 g. 27 m. 7 lo. 225 cars.
M. McDermott, Gen. Supt ...Ludington, Mich.
O. Wrege, M. M ....Ludington, Mich
J. Johnson, M. C. B.... ....Ludington, Mich.
Mason City & Ft Dodge R.R. 4-8½g. 92 m. 6 l. 151c.
C. C. Burdick, G. M. S. & P. A. Fort Dodge, Ia.
R. H. Emerson, M. M. & C. B. Fort Dodge, Ia
Massillon & Cleve. Ry. (See Penna Co.)
Meadville & Linesville Ry (See Pitts., Shen. & Erie Ry.)
Memphis & Charleston R.R. 4-9 g. 330m. 39 l. 1,049c.
R. B. Pegram, Gen. Supt ...Memphis, Tenn.
J. P. Minetree, Pur. Agt.. Washington, D. C.
J. H. Buckalew, M. M........Memphis, Tenn.
R. T. Hayes, M. C. B.... ....Memphis, Tenn.
Mexican Ry. 4-8½ g. 321 m. 59 lo. 743 cars.
Geo. Foote, Gen. Supt ....Mexico, Mex
H. G. Evans, Loco. Supt....... Mexico, Mex
Mexican Central Ry. 4-8½g. 1,876m. 149lo. 2,890c.
F. P. McIntyre, Pur. Agt ... ..Boston, Mass.
H. R. Nickerson, Gen. Man ..City of Mexico.
F.W.Johnstone. Supt.M.P.&M. City of Mexico
J. H. O'Brien, M. C. B.. ......City of Mexico.
P. O. Address of all Officers in Mexico is El Paso, Texas.)
Mexican International R. R.
4-8½ g. 575 m. 46 lo. 1,486 cars.
L. M. Johnson Gen. Man., Ciudad Porfirio Diaz, Mex.
W. Hollis, Pur. Agt. Ciudad Porfirio Diaz, Mex.
W. Jennings, M. M. & M. C. B.
Mexican National R.R. 3 g. 1,218 m. 122 lo. 2,538 c.
E. N. Brown, Gen. Man...... City of Mexico.
A. Anderson, Jr., Pur. Agt.. New York, N. Y
Thos. Milan, S. M. P. & Mach...Laredo, Tex.
Northern Division:
J. N. Galbraith, Supt...... .....Laredo, Tex.
J. Farrell. M. M..................Laredo, Tex.
San Luis Div.:
B. Magnum, Supt........San Luis Potosi, Mex.
M. J. Schneider, M. M...San Luis Potosi, Mex.
Southern Div.:
V. R. Dwinell, Supt......City of Mexico, Mex.
Richard Fitzsimmons, Act. M. M. Sant'go. Mex.
Michoacan & Pacific Ry.
3 g. 60 m. 5 lo. 100 cars.
A. Atwood, Gen Man.......Maravatio, Mex.
L. R. Gordon, Supt. & P. A.. Maravatio, Mex,
J. O. Nicholas. M.M.&M.C.B. Maravatio, Mex.
Michigan Cen. R. R. 4-8½g. 1,683m. 461 lo. 14,121c.
H. B. Ledyard, Pres.&Gen.Man. Detroit, Mich.
Robt. Miller, Gen. Supt......... Detroit, Mich.
J. R. Dutton, Pur. Agt.........Detroit, Mich.
C. E. Smart, Gen. M. M.... ...Jackson, Mich.
E. D. Bronner, M. C. B..........Detroit, Mich.
(1) Lines West of Detroit River:
East., Toledo & Bay City Divs.:
D. S. Sutherland, Supt ....Detroit, Mich.
P. Miller, M. M...... ....Detroit, Mich.
Sag. & Mack. Div.:
W. J. Martin, Supt.... ....Bay City, Mich.
M. Ryan, M. M... ... .Bay City, Mich.
Mid. Air Line: Gr. Rap. and So. Hav. Divs.:
O. F. Jordan, Supt..............Jackson, Mich.
West & Joliet Divs.:
J. H. Snyder, Supt............ ...Chicago, Ill.
J. G. Riley, M. M.... ....Chicago. Ill.
(2) Lines East of Detroit River:
Canada & Mich. Mid. Divs.:
J. B. Morford, Supt......... ..St. Thomas, Ont.
M. L. Flynn, M. M..........St. Thomas, Ont.
R. Potts, Gen. F. C. Dept....St. Thomas, Ont.
Millen & Southern. 4-8½ g. 32 m. 4 lo. 13 cars
J. F. Gray, Supt. & P. A.........Millen, Ga.
F. W. Reavey, M. M...............Millen, Ga.
Mineral Range and Hancock & Calumet Rys.
3 g. 42 m. 16 l. 466 cars.
W. F. Fitch, Gen. Man....Marquette, Mich.
J. C. Shields, Supt. & M. M. Hancock, Mich.
P. W. Brown, P. A..........Marquette, Mich.
C. Angee, M. C. B.............Hancock, Mich.
Midland No. Car Ry. (See Atl. Coast Line.)
Milwaukee & Northern R.R. (See C., M. & St. P. Ry. Co.)
Milwaukee, Lake Shore & Western Ry. Co. (See Chicago & Northwestern.)
Minneapolis & St. Louis Ry.
4-8½g. 583 m. 69 lo. 2,500 cars.
A. L. Mohler, Gen Man...Minneapolis, Minn.
T E. Clarke, Gen. Supt ...Minneapolis, Minn.
S. M. Lohren, Pur. Agt....Minneapolis, Minn.
J. Tonge, M. C. B.& M. M.. Minneapolis, Minn.
Minneapolis, St. Paul & Sault Ste. Marie.
4-8½ g. 1,160 m. 103 lo. 6,035 cars.
F. D. Underwood, Gen. Man. Minneapolis, Minn.
T. A. Switz, Pur. Agt......Minneapolis. Minn.
E. A. Williams Mech. Supt. Minneapolis, Minn.
Mississippi River & Bonne Terre Ry.
4-8½ g. 74 m. 9 lo. 110 cars.
J. Burns, Supt....... .....Bonne Terre, Mo.
G. Setz, P. A..............Bonne Terre, Mo.
J.F.Kehrmon, M.M.&M.C.B. BonneTerre, Mo.
Mississippi R. & No. West. Ry. 4-8½g. 12m. 2 lo. 35c.
A. Kimball, G. M.& Supt. Arkansas City, Ark.
P. Kimball, P. A..........Arkansas City, Ark.
E. Kroger, M. M.........Arkansas City, Ark.
Missouri, Kansas & Texas Ry.
4-8½ g. 2,073.1 m. 246 lo. 110 pass. c., 7,529 c.
Thos. C. Purdy, V.-P. & G.M.. St. Louis, Mo.
C. N. Stevens, Pur. Agt ....St. Louis, Mo.
Wm. O. Herin, Supt. M. P.....Parsons, Kan.
C. T. McElvany, M. M............Dallas. Tex.
J. Doyle, M. C. B..................Dallas, Tex.
Sam'l Irvin, Supt. Car Dept.... Sedalia, Mo.
Missouri Pacific Ry. System, including Missouri Pac. Ry., St. Louis, Iron Mountain and Southern Ry. and leased, operated and independent lines.
4-8½ g. 5,380 m. 641 lo. 23,072 cars.
Wm. B. Doddridge, Gen. Man.. St. Louis, Mo.
F. Rearden, Supt. Loco. & Car Depts., St. Louis, Mo.
A. Gould, Pur. Agt.... ....St. Louis, Mo.
L. Bartlett, Div. M. M..........St. Louis, Mo.
S. P Weller, Div. M. M......... Sedalia, Mo.
W. T. New, Asst. M. M....Kansas City, Kan.
W. J. Hill, Div. M. M......Osawatomie, Kan.
J. T. Jones, Asst. M. M......Ft. Scott, Kan
Central Branch Union Pac. Ry.
4-8½ g. 388.19 m. 35 lo. 564 ft. cars, 23 pass. cars.
H. G. Clark, Gen. Supt........St. Louis, Mo.
C. W. Weller, Div. M. M.... Atchison, Kan.
St. Louis, Iron Mountain & Southern Ry.
4-8½ g. 1,773.47m. 255 lo. 9,486 ft. cars, 131 pass. c.
E. A. Peck, Gen. Supt.... .... St. Louis, Mo.
W. H. Harris, M. M.... ....De Soto, Mo.
Mord. Roberts, M. M......Baring Cross, Ark.
M. B. Schaffer, Gen. F. C. D.. St. Louis, Mo.
Mobile & Ohio R. R. 4-8½ g. 687 m. 107 lo. 3,687 c.
John G. Mann, Gen. Man..........Mobile, Ala.
R. H. Duesberry, Pur. Agt. ....Mobile, Ala.
M. T. Carson, Supt. Machy.. Jackson, Tenn.
J. D. Gurganus, M. C. B.......Whistler, Ala.
St. L. Div.: H. W Clarke, Supt. Ea. St. Louis, Ill.
A. B. Minton, M. M.... ...Murphysboro, Ill.
G. Manuel, M. M .. ..Jackson, Tenn.
D. O. Smith, M. M.............Whistler, Ala.
Mohawk & Malon Ry. (See N.Y. C. & H. R. R. R.)
Monongahela River R. R. 4-8½ g. 33 m. 7 l. 1,135 c.
H. G. Bowles. G.M.&P.A....Monongah, W.Va.
Wm. Stanhagen, M.M.&M.C.B. Watson, W.Va.
Monson R. R. 2 g. 8 m. 2 lo. 15c.
J. F. Kimball, Gen. Man.... ....Wilton. N. H.
W. L. Estabrooke, Pur. Agt.....Monson, Me.
H. E. Morrill, M.M &M.C. B....Monson, Me.
Montana Central Ry. 4-8½ g. 253 m. 21 lo. 835 c. (See Great Northern.)
Montana Union Ry. Co 4-8½ g. 72 m. 29 l. 369 c.
Wm. H. Burns, Gen. Man. & P. A Butte Mont.
G Lindoff, M. M. & M. C.B. Anaconda, Mont.
Monterey & Mex. Gulf. Ry. 4-8½ g. 390m. 127 lo. 595c.
J. A. Robertson. G.M.& Rec...Monterey, Mex.
D. W. Lindsay, Pur. Agt. ....Monterey. Mex.
F. C. Barron, M.M. & M.C.B. Monterey, Mex.
Montour R. R. 4-8½ g. 12 m. 2 lo. 260 cars
U. A. Andrews, Gen. Man.&P.A. Pittsburgh, Pa.
V. M. Delamater, Supt.... ..... .Imperial, Pa.
Jas. Nelson, M. M. & M. C. B....Imperial. Pa.
Montpelier & Wells Riv. R.R. and Barre Branch R.R.
4-8½ g. 44 m. 6 lo. 115 c.
W. A. Stowell, Gen. Man.......Montpelier, Vt.
F. W. Morse, Pur. Agt ... .Montpelier, Vt.
G. Jacobson, M. M.......... .. Montpelier, Vt.
C. F. Robinson, M. C. B.... ...Montpelier, Vt.
Morgan's Louis.& Tex. R.R. (See Southern Pacific.)
Mount Washington R. R. 4-7½ g. 3 m. 7 lo. 10 cars.
D. C. Prescott, Gen. Man.....Concord, N. H.
W. H. Alexander, Pur. Agt....Concord, N. H.
John Horne, M. M. & M.C. B. Lakeport, N. H.

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Narragansett Pier R. R. 4-8½ g. 8½ m. 2 lo. 16 c.
G. T. Lanphear, Supt.& Pur. Agt. Peacedale, R.I.
E. Gardner, M. M...... ......Peace Dale, R. I.
Nashville, Chattanooga & St. Louis Ry.
4-9 g. 884.09 m. 161 lo. 4,630 cars.
J. W. Thomas G. Man.........Nashville, Tenn.
J. W. Thomas, Jr., Pur. Agt., Nashville, Tenn.
James Cullen. M. M. & C.B...Nashville, Tenn.
Natchitoches & Red River Valley R. R. Co.
4-8½ g. 16 m. 2 lo. 11 cars.
L. Caspari, G. Man. & P. A. Natchitoches. La
Nevada, California and Oregon Ry. 3g. 80 m. 4 lo 50 c.
E. Gest, Gen. Man........... .. .Reno, Nev
Nevada Central R. R. 3 g. 93 m. 3 lo. 41 c.
W. J. Phillips, Gen. Man. & P.A.. Austin. Nev.
J. C. Slater, M. M. & M. C. B. Battle Mountain, Nev
Nevada County N. G. R. R. 3 g. 23 m. 3 lo. 60 cars
John F. Kidder, G.Man.&P.A. Grass Valley, Cal.
Jas. McCormick. M. M. & C. B. Grass Valley, Cal.
New Brunswick & Prince Edward Island Ry.
4-8½ g. 36 m. 3 lo. 37 cars.
Josiah Wood, Gen. Man......Sackville, N. B.
F. C. Harris, Supt., P.A &M.M. Sackville, N. B.
Newburg, Dutchess & Conn. R. R.
4-8½ g. 58 miles, 7 l. 132 c.
John S. Schultze, Gen. Man. & P. A. Matteawan, N. Y.
Gilman D. Holmes, M. M. & C. B., Dutchess Junction, N.Y.
New Jersey & New York Ry.
4-8½ g. 45 m. 10 lo. 115 c.
J. D. Hasbrouck, Gen. Man. & P.A., Jersey City, N. J.
J. S. Drake, Supt. & M. M... ...Hillsdale, N. J.
L. B. Van Wagner, M. C. B .....Hillsdale. N. J.
New London Northern R. R. (See Central Ver.)
New Mexico & Arizona. (See A.T.&Santa Fe R.R.)
New Orleans, Fort Jackson & Grand Isle R. R.
4-8½ g. 61 m. 5 lo. 59 cars.
J. S. Landry, Supt. & P. A.... ...Algiers, La
C. S. Burgis, M. M. & M. C. B.....Algiers, La.
New Orleans & Northwestern Ry.
4-8½ g 102 m. 7 lo. 70 cars
L. K. Hyde, Rec. & G. M ....Natchez, Miss.
C. G. Vaughn, Pur. Agt...... Natchez, Miss.
New Orleans & Southern R.R. 4-8½ g. 66 m. 6 l. 50c.
G. S. Taylor, G. Man. & Rec. New Orleans, La.
Newport News & Miss. Val. Co. (See Ch. & O. S. W.)
4-9 g. 413 m. 92 l. 3,659 cars.
Newport & Sherman's Valley.
3′ g. 31 m. 4 lo, 62 cars.
D. Gring, Gen. Man.&Pur. Agt. Newport, Pa.
C. C. Allen, M. M.......... .....Newport, Pa.
N. Y. & Greenwood Lake Ry. (See N. Y., L. E. & W.)
New York & New England R. R.
4-8¾ g. 527 m. 212 lo. 6,640 cars.
J. T. Odell, Gen. Man...........Boston, Mass.
Edward Mahler, Pur. Agt. ......Boston. Mass.
Thomas Kearsley, M. M..... Norwood, Mass.
N.&W. Div.: J. N. King, Supt.. Providence, R. I.
S. F. Whaley, M. M . ... Norwich, Ct
New York & Northern. 4-8½ g. 61 m. 21 lo. 345 c. (See N. Y. Central.
N. Y. Central & Hudson River R.R.
4-8½ g. 967 m., 844 lo. 1,049 pass. c., 26,791 frt. c.
J. M. Toucey, Gen. Man...... New York. N. Y
A. Bourn, Pur. Agt.......... New York, N. Y.
Wm. Buchanan, Supt. M. P.. New York. N. Y.
Jas. Buchanan, Asst. S.M.P. West Albany, N.Y.
G. H. Hazelton, Asst. Supt. M.P.. Depew, N.Y
Mohawk Div.:
J. R. Leonard, Supt...........Albany, N. Y.
Geo. Van Tassell, M. M.....New York, N. Y
Jas. Buchanan, M. M......W. Albany, N. Y.
F. W. Chaffee, M. C. B....W. Albany, N. Y.
W'n Div.: J. P. Bradfield, Supt...Buffalo, N. Y.
S. L. White, M. M....... .... Syracuse. N. Y.
Amos Gould, M. M..... ....E. Buffalo, N. Y.
J. Macbeth, M. C. B.... ....E. Buffalo, N. Y.
Peter Smith, M. C. B.....E. Rochester, N. Y.
N. Y. Chic. & St. L. R.R 4-8½ g. 524 m. 148 lo. 7,425 c.
A. W. Johnston, Gen. Supt...... Cleveland, O.
M. M. Rodgers, Pur. Agt ....Cleveland, O.
John Mackenzie, Supt. M. P .....Cleveland, O.
Eas'tn Div.: W. L. Blair, Supt.....Conneaut, O.
E. A. Miller, M. M.. .... Conneaut. O
West'n Div.: C. D. Gorham, Supt. Ft. Wayne, Ind
Geo. James, M. M..........Stony Island, Ill
New York, Lake Erie & Western R. R.
4-8½ g. 1,075 m. 675 lo. 661 pass. c. 29,104 frt. c.
E. B. Thomas, J. G. McCullough, } Recs.. .New York, N. Y.
A. E. Mitchell, Supt. M. P....New York, N. Y.
E. B. Sheffer, Pur. Agt.. .... New York, N. Y.
N. Y., L. E. & W. Div.:
S. R. Johnson, Gen. R. M... Jersey City, N. J.
East Div.: M. W. Maguire, Supt, Jersey City, N.J
H. A. Childs, M. M....... Jersey City, N. J
Del. Div.: W. L. Derr, Supt...Port Jervis, N. Y.
J. Hainen, M. M ....Port Jervis, N. Y.
Susq. Div.: J. F. Maguire, Supt... Elmira, N. Y.
I. Bond, M. M...... ......Susquehanna, Pa.
Buff. & S. W. Div.:
C. A. Brunn, Supt.... ... .Buffalo, N. Y.
J. H. Moore, M. M..............Buffalo. N. Y.
Robert Gunn, For. C. Rep .....Buffalo, N. Y.
Roch. Div.: G. A. Thompson, Supt. Rochester, N.Y.
F. N. Hibbits, M. M... ....Rochester, N. Y.
W'n Div.: H. E. Gilpin, Supt. Hornellsville, N.Y
C. P. Weiss, M. M.......Hornellsville. N. Y
Tioga Div.: E. E. Loomis, Supt...Elmira, N. Y.
Bradford Div.: C. V. Merrick, S...Bradford, Pa.
C. P. Weiss, M. M...... ....Bradford, Pa.
N. Y. & Greenwood L. Ry.
4-8½ g. 51 m. 2 lo. 24 pass. c. 30 frt. c.
N. R. R. of N. J. Div.: 4-8½ g. 26 m. 40 p.c.
B. E. Moody, Supt..........Jersey City, N. J.
N. Y., Pa. & O. Div.
4-8½ g. 599 m. 254 lo. 143 pass. c. 9,635 frt. c.
A. M. Tucker, Gen. Man ......Cleveland, O.
J. C. Moorhead, Gen. Supt......Cleveland, O.
W. Lavery, Asst. Supt. M. P..Cleveland, O
1st & 2d Div.: I. Belnap, Supt....Meadville, Pa.
F. B. Smith, M. M........ . Meadville, Pa.
3d & 4th Divs.: C. A. Allen, Supt.... Galion, O.
A. W. Ball, M. M... ....Galion, O.
Maho'g Div.: H. N. Donaldson, Supt. Youngstown, O.
George Donahue, M. M ....Cleveland, O
New York, New Haven & Hartford R. R.
4-8½ g. 1,446.95 m. 681 lo. 13,574 cars.
C. H. Platt, Gen. Supt ... .New Haven, Conn.
H. A. Bishop, Pur. Agt.... ... New Haven, Ct.
Old Colony System:
J. Henney, Jr., Supt. M.P.. New Haven, Conn.
E. G. Allen, Gen. Supt..........Boston, Mass.
R. W. Husted, Pur. Agt.........Boston, Mass.
Lewis Wyler, M. M..........Hartford, Conn.
J. W. Leary, M. M........New Haven, Conn.
J. F. Brady, M. M .....Harlem River, N. Y.
F. M. Twombly, M. M... .....Boston, Mass.
S. P. Willis, M. M......... ......Boston, Mass.
A. W. Twombly, M. M.......Taunton, Mass.
L. M. Butler, M. M..... .....Providence, R. I.
N.Y., Ontario & West. Ry. 4-8½ g. 477m. 133 lo., 6,263c.
J. E. Childs, Gen. Man ....New York, N. Y.
Chas. A. Draper, Pur. Agt....New York, N. Y.
Geo. W. West, Supt. M. P.. Middletown, N Y.
N.Y., Pennsylvania & Ohio R. R. (See N.Y., L.E.&W.)
New York, Philadelphia & Norfolk R. R.
4-8½ g. 112 m. 16 lo. 615 c.
W.A. Patton, V.P.G.M.&P.A. Philadelphia, Pa.
C.O. Skidmore, M.M.&M.C.B. Cape Charles, Va.
New York, Providence & Boston R. R. See N. Y., N. H. & H. R. R.
N. Y., Susqueh'na & W'n. 4-9 g. 150 m. 50 lo. 2,912 c.
Chas. D. McKelvey, Gen. Supt. Jersey City, N. J.
C. T. Demarest, Pur. Agt.....Jersey City, N.J.
W.C. Ennis, M.M. & C. B. North Paterson, N. J
Norfolk, Albemarle & Atl. 3 g. 18 m. 4 lo. 49 c
B. P Holland, Supt.& Pur. Agt. Norfolk, Va.
A M. Gibbs, M. M.... .... Norfolk, Va.
F. O. Clibourne, M. C. B....... ..Norfolk, Va.
Norfolk & Western R. R. 4-9 g. 1,567m. 416lo. 17,968c.
F. J. Kimball, P. & Rec....Philadelphia, Pa.
Henry Fink, Receiver ......Philadelphia, Pa.
Jos. H. Sands, V.P. & Gen. Man.. Roanoke, Va.
Wn. G. Div.:
E. T. Burnett, Pur. Agt.............Phila., Pa.
L. P. Ligon, M. M......... Bluefield, W. Va.
S. K. Dickerson, M. M....East Radford, Va.
R. H. Soule, Supt. M. P.M.&C.B. Roanoke, Va.
John Cullman, M. M.... ...Portsmouth, Va.
N. W. Norsworthy, M. M.........Crewe, Va.
Norfolk & Southern R. R. 4-8½ g. 113 m. 13 lo. 282 c
M. K. King, Gen. Man.... ....Norfolk, Va
I. P. Jernigan, Pur. Agt..........Norfolk, Va.
G. R. Joughins, S. M. P........ ..Berkley, Va
R. W. Barrett, M. C. B.... ......Berkley, Va)
North-Eastern R. R. (S. C.) (See A. Coast Line
Northern Adirondack Ry. 4-8½ g. 57.5 m. 6 lo. 515c.
Alex. Munn, Receiver ....Brooklyn, N.Y.
J. H. Hamilton, Gen. Man. Tupper Lake, N.Y.
E. Lalime, M. M. ....Santa Clara, N. Y.
Northern California R. R. (See So. Pac. Co.)
Northern Central Ry. (See Penna. R. R.)
North'n Pacific R. R. 4-8½g. 4,495m. 634lo. 18,968c.
J. W. Kendrick, Gen. Man....St. Paul, Minn.
W. G. Pearce, Gen. Pur. Agt..St. Paul, Minn.
J. Hickey, Supt. M. P., M. & R. S. St. Paul, Minn.
J. C. Barber, M.C.B.. Como Shps, do.
Minn. Div.:
S. L. Bean, M. M.... ....Brainerd, Minn.
Dak. Div.: C. J. Wilson, Supt...Jamestown, Dak
F. N. Regan, M. M............Fargo, N. Dak
Manitoba Div.:
G. W. Vanderslice, Sup. Winnipeg, Manitoba.
J. T. Ford. M. M ....Winnipeg, Manitoba.
Missouri and Yellow Stone Div.:
E. J. Pearson, Supt... ......Glendive, Mont.
M. M.... .Glendive, Mont.
Montana Div.:
J. D. Finn, Supt .. ..Livingston, Mont.
Angus Brown, Div. M.M...Livingston, Mont.
R. M. Div.: W.H. Brimson, Supt. Missoula, Mont.
W. S. Clarkson, M. M.. ....Missoula, Mont.
Idaho Div.: F. W. Gilbert, Supt. Spokane, Wash.
Wm. Moir, M. M ....Spokane, Wash.
Pac. Div.:
Jos. McCabe, Supt...........Tacoma, Wash.
H. H. Warner, M. M........Excelsior, Wash.
North Pacific Coast R. R. 3 g. 94 m. 12 lo. 391 cars.
J. B. Stetson, G. M........San Francisco, Cal.
W. F. Russell, Pur. Agt....San Francisco, Cal.
W. J. Thomas, M. M. & M. C. B. Sausalito, Cal.
Northwestern Ohio Ry. (See Pa. Co.)
North Galveston, Houston & Kansas City Ry. (See Galveston, La Port & Houston Ry.

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Ohio Central Lines:
Toledo & Ohio Central Ry. 4-8½ g. 359 m. 85 lo. 6,494 cars.
Kanawha & Michigan Ry. 4-8½g. 168 m. 15 lo. 600 cars.
J. M. Ferris, Gen. Man.... ....Toledo, O.
H. A. Cooper, Pur. Agt.............Toledo, O.
J. B. Morgan, M. M. & M. C. B. Bucyrus, O.
Ohio & Big Sandy R. R. (See C. & O. Ry. Co.)
Ohio & Mississippi Ry. (See B. & O. Southwestern).
4-9 g. 636 m. 124 lo. 3,823 cars
Ohio River R. R. 4-8½ g. 225 m. 23 lo. 1,303 cars.
Geo. A. Burt, V.P.&G.M. Parkersburg, W.Va.
C. L. Williams, A. S.& P.A. Parkersburg, W.Va.
J.B. Dorsey, M. M.... ... Parkersburg, W. Va.
Ohio Southern R. R. 4-9 g. 225 m. 30 lo. 6,265 c.
G. W. Saul, Gen. Man. & Rec.. Springfield, O
Horner T. Dick, Pur. Agt......Springfield, O.
A. J. Ball, M. M. & M. C. B. Springfield, O.
Ohio Valley Ry. (See C. & O. Southwestern).
4-9 g. 136 m. 11 l. 346 c.
Old Colony R. R. 4-8½ g. 603 m. 238 lo. 4,917 cars. (See N. Y., N. H. & H.)
Omaha & St. Louis Ry. 4-8½ g. 145 m. 15 lo. 422 c.
John F. Barnard, Rec..........Stanberry, Mo.
F. P. Boatman, Pur. Agt.&M.M. Stanberry, Mo.
Oregon & California R. R. (See Southern Pac. Co.
Ore. Imp. Co. 3 and 4-8½ g. 144 m. 18 lo. 318 c.
C. J. Smith, Gen. Man.......Seattle, Wash.
W. E. Nichols, Pur. Agt......Seattle, Wash.
Seattle & Northern Ry. 4-8½ g. 36 m. 3 lo. 40 c.
C. J. Smith, Gen. Man..........Seattle, Wash.
W. E. Nichols, Pur. Agt...... .Seattle, Wash.
D. O'Leary, M. M...............Seattle, Wash
Oregon Pacific R. R. 4-8½ g. 138 m. 16 lo. 343 c.
Charles Clark, Receirer.........Corvallis, Ore.
H. E. Chipman, M. M. & M.C.B. Yaquina, Ore.
Ottawa & Gatineau Ry.
4-8½ g. 58 m. 4 lo. 44 cars.
P.W. Resseman, G Supt.& P.A Ottawa, Ont.
Jas. Kay, M. M. & M. C. B....Ottawa, Ont.

P

Pacific Coast Ry. Co. 3 g. 76 m. 6 lo. 195 c.
C.O. Johnson, Supt.&P.A. San Luis Obispo, Cal.
J. Lind, M. M............San Luis Obispo, Cal.
J.M. Vincent, For. Car Shop. San Luis Obispo, Cal.
Paducah, Tennessee & Alabama R. R. & Tenn. Midland Ry
4-8½ g. 255 m. 16 l. 583 cars.
W. J. Hills, Supt & Pur. Agt...Paducah, Ky.
A. S. Chute, M. M.............Paducah, Ky.
J. W. Troutman, M. C. B......Paducah, Ky.
Panama R. R. 5 g. 47 m. 38 lo. 1,509 cars
A. L. Rives, Gen. Supt.........Colon, Rep Col
G. Reynaud, Pur. Agt.........New York, N. Y
D. G. Mott, M. M & M. C. B.. Colon, Rep. Col.
Pecos Val. & Pecos River R.R. 4-8½g. 164m. 6 l. 60c.
Jeff. N. Miller, G. M. & P. A. Eddy, New Mex.
G. F. Miller, M.M.&M.C.B. Eddy, New Mex.
Pennsylvania & North Western R. R.
4-9 g. 73 m. 45 lo. 1,570 cars.
F. S. Lewis, Gen. Man.&Pur. Agt.. Phila., Pa.
Geo. Van Brunt, M. M.... ..... .Bellwood, Pa.
A. Zimmerman, M. C. B.... .. Bellwood, Pa.
Pennsylvania Company operating Pitts., Fort Wayne & Chicago; Massillon & Clev So. Chi. & South'n; State Line & Indiana City; Pittsburgh, Youngstown & Ashtabula; Cleve. & Pitts.; Erie & Pitts.; Newcastle & Bea. Val., and T. W. V. & O.; Pittsburgh, Ohio Valley & Cincinnati.
4-9 g. 1,076 m. 508 lo. 35,648 cars.
Gen. Divs. (1), (2), (3), (4) and (5).
J. T. Brooks, 2d V.-Pres. .. ...Pittsburgh, Pa.
Joseph Wood, Gen. Man.. ....Pittsburgh, Pa
A. W. Sumner, Pur. Agt.......Columbus, O.
Geo. L. Potter, Supt. M. P ....Fort Wayne, Ind.
(1) E'n Div.: 205m.
A. B. Starr, Supt..........Allegheny City, Pa.
W. F. Beardsley, M. M. Allegheny City, Pa
Geo. P. Sweeley, M. M. .... . Crestline, O.
(2) W'n Div.: 304 m., C. D. Law, Supt. Ft. Wayne, Ind.
W. W. Atterbury, M. M ...Ft. Wayne, Ind.
J. A. Graham, For. Car Rep. Ft. Wayne, Ind,
3) Erie & Ashtabula Div., 224 m.
H. W. Byers, Supt......Lawrence Junc., Pa.
G. J. Parkin, M. M...... ....Erie, Pa.
(4) Cleveland & Pittsb'g Div: 217 m.
L. F. Loree, Supt......... ... .Cleveland, O.
T. F. Butler, M. M...........Wellsville, Ohio.
(5) Toledo Div.: 126 m., W.H. Potter Supt. Toledo, O.
W. M. Lowe, M. M ....Toledo, O.
Pennsylvania R. R. Co.'s Roads. (7 Gen. Divs.)
4-9 g. 4,045 m. 2,283 loco. 82,304 cars.
S. M. Prevost, Gen. Man.....Philadelphia, Pa
Samuel Porcher, Ast. Pur. Agt. Philadelphia, Pa
F. D. Casanave, Gen. S. M. P......Altoona, Pa
1) Pennsylvania R. R. Divs.
Frank L. Sheppard, Gen. Supt Altoona, Pa.
J. M. Wallis, Supt. M. P.......Altoona, Pa.

G. W. Strattan, M. M........ Altoona, Pa
Jno. P. Levan, Gen. For. C. Shps. Altoona, Pa
Phila. Div.: Tho. Gucker, Supt. .. W. Phila., Pa
H. D. Garrett, M. M.. .W. Philadelphia, Pa
I. W. Van Houten, Gen. For. C.S. W. Phila., Pa
Schuylkill Div..
W.H.Meyers, Supt..............Reading, Pa.
Mid. Div.: Frank Ellmaker, Supt. Harrisburg, Pa.
E. L. Caum, M. M...........Harrisburg, Pa
W. F. Eberle, Gen.....For. C.S. Ha'burg, Pa
Altoona Div.: R. E. Marshall. Supt. Altoona, Pa.
Pitts. Div.: Robert Pitcairn. Supt. .Pittsburgh, Pa.
D. O. Shaver, M. M...........Pittsburgh, Pa.
W.Pa.Div.: D. M. Watt. Supt....Allegheny City.
Wm. B. Norris, M. M..........Blairsville, Pa.
M. H. Fails, Gen. For. C. S....Blairsville, Pa.
Fred. Div.: A. W. Moss, Supt.........York, Pa
A. O. Baker, M. M.............Columbia, Pa.
Tyrone Div.: S. S. Blair, Supt........Tyrone, Pa.
J. A. Beamer, M. M...............Tyrone, Pa.
Lew. Div.: A. E. Reed, Supt....Lewistown, Pa.
Isaiah Paxson, M. M.........Lewistown, Pa
Bed. Div.: Victor Wierman, Supt. Bedford, Pa.
And. Green. Fore. of Shop ..State Line, Pa.
Monong. Div.: D. H. Lovell, Supt. Pittsburgh, Pa
Wm. Lininger. Gen. Foreman Pittsburgh, Pa
(2) United R. Rs. of N. J. Divs.:
F. Wolcott Jackson, Gen. Supt. Jersey City, N.J
H. S. Hayward, Supt. M. P. .Jersey City, N. J.
H. Canfield. M. M.............Hoboken, N. J
N.Y.Div.: E. F. Brooks, Supt. ..Jersey City, N.J.
H. Canfield, M. M.......... Hoboken, N. J.
J. W. Sanford, M. M.... ..Meadows, N. Y.
Belv. Div.: A. P. Gest, Supt. Lambertville, N.J
R. McDowell, M. M.......Lambertville, N. J
Amboy Div.: W. Brown, Supt.....Camden, N.J
Thos. Kerr, M. M...........So. Amboy, N. J
R. Hill, M. M...................Camden, N. J.
W. McAlister, M. M.............Camden, N.J
P. S. Bogart, Gen. For......So. Amboy, N. J
(2½) Camden & Atlantic:
A. O. Dayton, Supt................ Camden, N. J.
(3) West Jersey R. R.
A. O. Dayton, Gen. Supt..... ..Camden, N. J
(4) Phila., Wilm. & Balt. R.R.
H. F. Kenney, Gen. Supt. . ..Philadelphia, Pa.
Clarence Mendenhall, S.M.P. Philadelphia, Pa
C. G. Turner, M. M...........Wilmington, Del.
(5) Phila. & Erie R. R. Divs.:
R. Neilson, Gen. Supt.... ...Williamsport, Pa.
Edw. D. Nelson, Supt. Mo. Po. Williamsport, Pa.
Northern Central Ry.
Robert Neilson, Gen. Supt...Williamsport, Pa
Edw. D. Nelson, Supt. M. P..Williamsport, Pa
J. M. Coale, M. M................Baltimore, Md.
G. W. Demarest, Gen. For.. Baltimore, Md.
Elm. & Can. Divs.: S. Meade, Supt..Elmira, N.Y.
Jas. Strode, M. M..............Elmira, N. Y.
J. C. Dyott, Gen. For...... ...Elmira, N. Y
Pensacola, Ala. & Tenn. Ry. 5 g. 26 m. 3 lo. 93 cars
S. R. Dishman, Pres. & P. A. .Pensacola, Fla
Peoria & Pekin Union Ry. 4-8½ g. 20 m. 17 lo 260 c
F. L. Tompkins, Supt..............Peoria, Ill.
Jas. W. Hill, M. M.................Peoria, Ill
John G. Evans, Fore. Car Rep ...Peoria, Ill.
Peoria, Decatur & Evansville Ry.
4-8½ g. 330m. 33 lo. 1,790 cars.
E. O. Hopkins, Gen. Man.....Evansville, Ind.
H. W. Matters, Pur. Agt........Princeton, Ind.
C. C. Robinson, M. M. & M. C. B. Mattoon, Ill.
Perkiomen Ry. 4-8½ g. 39 m. Locos. and cars leased from Reading R. R. Co.
H. Boyd, P. A.....................Norristown, Pa.
Philadelphia & Erie R. R. (See Penna. R. R.; (5) Div.)
Phila., Harrisb. & Pittsb. R.R. (See Phila. & Read. R.R.)
Philadelphia & Reading R. R.
4-8½ g. 1,190 m. 781 lo. 30,073 cars.
A. Foster, Pur. Agt ....Philadelphia, Pa.
L. B. Paxson, Supt. M.P. & R.E...Reading, Pa.
E. E. Davis, A. S. M. P. & R.E. Reading, Pa.
J. H. Rankin, M. C. B.............Reading, Pa.
Main Line Div.: I. A. Sweigard, G. Supt. Phila., Pa.
G. F. H. Von Wrede, M. M..Philadelphia, Pa.
Phila., Reading & New England.
4-8½ g. 181 m. 43 l. 637 cars.
Jas. K. O. Sherwood, Rec.. New York, N.Y.
C. M. Lawler, G. M. & Pur. A. Hartford, Conn.
E.M.Humstone, M. M. & M.C.B. Hartf'd, Conn.
Phila., Newtown & New York R. R. 4-8½ g. 23 m.
W. M. Geary, Supt.............Philadelphia, Pa.
Howard Boyd, Pur. Agt ......Norristown, Pa.
Phila., Wilmington & Balt. R. R. (See Penna. R. R.
Piedmont Air Line (See Rich. & Danville.
Pine Bluff & Eastern Ry. 3 ft. g. 33 m. 2 lo. 21 c.
H. E. Martin, G. M. & P. A. Pine Bluff, Ark.
W. H. Hall, M. M.......... Pine Bluff, Ark.
R. H. Strong, M. C. B.........Pine Bluff, Ark.
Pittsburgh, Akron & Western R. R.
4-8½ g. 165 m. 8 lo. 250 c.
J.H. Sample, Gen. Supt. & Pur. Agt. Akron, O.
B. F. Marshall, M. C. B. & M. M...Delphos, O.
Pittsburgh, Brady's Bend & Lake Erie R. R.
Jos. Pool, Pres..............New York, N. Y.
Harwood R. Pool, Sec'y......New York, N.Y.
Executive Office, 62 Cedar St., New York, N.Y.
In course of construction.
Pitts. & Castle Shannon R.R. 3-4 g. 7 m. 4 lo. 10 pass.
E. J. Reamer, Supt. & Pur. Agt. Pittsburgh, Pa.
Holmes Ward, M. M......Castle Shannon, Pa.
R. A. A. Patterson, M. C. B ..Pittsburgh, Pa.
Pitts. & Lake Erie R. R. and lesses of Pitts., McK. & Yough R. R. 4-8½ g. 399 m. 103 lo. 5,352 c
R. Evans, Pur. Agt. .... Pittsburgh, Pa.
L. H. Turner, M. M. & M. C. B.,
McKee's Rocks P. O., Pa.
Pitts. & West. Ry.: 3 & 4-8½ g. 353m. 119 lo. 5,435 c.
R. B. Campbell, G. M.........,Baltimore, Md.
J. V. Patton, Gen. Supt....... Pittsburgh, Pa.
R. Finney, Jr., Pur. Agt.......Allegheny, Pa.
Thos. Anderson, M. C. B.......Allegheny, Pa.
Wm. Truby, Supt. West. & Lake Div.
Allegheny, Pa.
I. N. Kalbaugh, M. M......... Allegheny, Pa.
Pittsburgh, Chartiers & Youghiogheny Ry.
4-8¾ g. 17 m. 7 lo. 95 c.
J. B. Safford, Supt........McKee's Rocks, Pa.
Pittsburgh, Bradford & Buffalo Ry. (See Pitts. & West
Pittsburgh, Cincinnati, Chicago & St. Louis Ry.
4-9 g. 1,473 m. 501 lo. 12,525 cars.
J. T. Brooks, 2d V. Pres.......Pittsburgh, Pa.
Jos. Wood, Gen. Man ....Pittsburgh, Pa.
H. O. Hukill, Pur. Agt ...... Pittsburgh, Pa.
S. P. Bush, Supt. M. P......... .Columbus, O.
B. Fitzpatrick, M. M.............Columbus, O
John Cummerford, For. C. S....Columbus, O.
Pittsb. Div.: J. J. Turner, Supt. Pittsburgh, Pa.
W. C. Arp, M. M................Dennison, O.
J. B. Swann, For. C. S............Dennison, O.
Ind. Div.: F. G. Darlington, Supt. Indianapolis, Ind.
Wm. Swanston, M. M......Indianapolis, Ind.
P. H. McGraw, For. C. S....Indianapolis, Ind.
Chic. Div.: C. H. Walbon, Supt. Logansport, Ind.
W. C. Pennock, M. M......... Logansport, Ind.
J. Hannon, For. C. S.........Logansport, Ind.
Indianapolis & Vincennes R. R.
M. W. Mansfield, Supt......Indianapolis, Ind.
Jas. Landers, Road For. Eng. Indianapolis, Ind.
Pittsburgh, Ft. Wayne & Chicago Ry. (See Penna. Co.)
Pittsburgh, Marion & Chicago Ry. 4-8½ g. 25m. 3 l. 43c.
C. H. Smith, Receiver......... New Lisbon, O.
R. Beeson, M. M. & M. C B. New Galilee, Pa.
Pittsburgh, McK. & Yough. (See P. & L. E.
Pittsburgh, Shenango & Lake Erie Ry.
4-8½ g. 184 m. 26 lo. 1,400 c.
J. T. Blair, G. Man............Greenville, Pa
W. G. Sargeant, Pur. Agt....... Meadville, Pa.
E. B. Gilbert......M. M. & C. B. Shenango, Pa.
Pittsburgh, Youngstown & Ashtabula. (See Penn. Co.)
The Plant System, operating the Savannah, Florida & Western Ry.
4-9 g. 569 m. 92 lo. 2,228 cars.
Bradford Dunham, G. Supt....Savannah, Ga.
M. F. Loughman, Pur. Agt. New York, N.Y.
Wm. Rutherford, Supt. M. P..Savannah, Ga.
G. M. Riley, M. M..............Savannah, Ga.
South Florida R. R. Co. 4-9 g. 306 m. 32 lo. 663c.
H. A. Ford, Supt................Sanford, Fla.
A. B. Allen, M. C. B..............Sanford, Fla.
Charleston & Savannah Ry.
4-8½ g. 120 m. 23 lo 751 cars.

C. S. Gadsden, Supt. ... Charleston, S. C.
M. F. Loughman, Pur. Agt. New York N.Y.
G. M. D. Riley, M.M. & M.C.B. Savannah, Ga.
Alabama Midland Ry.
4-8½ g. 208 m. 18 lo. 450 cars.
C. O. Parker, Supt..........Montgomery, Ala.
T. M. McDonough, S. M. Montgomery, Ala.
Brunswick & Western.
4-9 g. 170 m. 23 lo. 591 cars.
G. W. Haines, S. & P. A. ... Waycross, Ga.
D. B. Overton, M. M. & M. C. B. Brunswick, Ga.
Silver Springs, Ocala & Gulf Ry.
4-8½ g. 80 m. 4 lo 26 c.
J. W. Craig, Supt.... ... High Springs, Fla.
Pontiac, Oxford & Northern R. R.
4-8½ g. 100 m. 6 lo. 121 c.
Wm. C. Sanford, Gen. Supt.... Pontiac, Mich
W. C. Sanford, Pur. Agt.......Pontiac, Mich.
F. H. Neward. M. M.............Pontiac, Mich
Pontiac Pacific Junc. Ry. 4-8½ g. 60 m. 4 lo. 33 cars
H. J. Benner, Gen. Man. . . Montreal. Can
H. L. Maltby, P. A........ ....Montreal, Can.
Jas. Kay, M. M. & M. C. B.........Aylmer, Can.
Port Royal & Augusta Ry. 4-9g. 112 m. 15 lo. 142 c.
Jno. H. Averill. Rec ....Port Royal, S.C.
C. N. Averill, Pur. Agt......Port Royal, S. C.
Jno. S. Cook, M. M........... Augusta, Ga.
E. S. Schutz, M. C. B..... .. Augusta, Ga.
Port Royal & Western Carolina Ry.
4-9 g. 227 m. 14 lo. 120 cars.
John B. Cleveland, Rec..........Augusta, Ga.
J. W. Corner, Pur. Agt.........Savannah, Ga.
W. H. Stubb, M. M............. Augusta, Ga.
Portland & Rochester R.R. 4-8½ g. 55 m. 12 lo. 310c
J. W. Peters, Supt. & Pur Agt...Portland, Me
E. H. C. Tompson, M.M. & M.C.B. Portland, Me
Portland & Rumford Falls Ry.
4-8½ g. 57 m. 6 l. 86 cars.
L.L.Lincoln, S., G. M. & P. A. Rumford Falls Me.
W. R. Davis, M. M.......Rumford Falls, Me
Port Jervis, Monticello & New York.
4-8¼ g. 42 m. 3 lo. 18 cars.
B. Ryall, Rec. & Gen. Man. Port Jervis, N. Y.
A. Vanaken, M. M.......... Port Jervis, N Y
Potomac, Fred.'g & Pied. R R 3 g. 38 m 2 lo., 37
W. H. Richards. G. M. & P. A. Fred'cksburg, Va
W. P. Johnson, M. M. ....Fredericksburg, Va
W. C. Wilkins, M. C. B....Fredericksburg, Va.
Poughkeepsie & Eastern.
4-8½ g. 40 m. 5 l. 59 c.
E. C. Osborne, Act G. M..Poughkeepsie, N.Y.
J. L. Donaldson, M.M.. .Poughkeepsie, N. Y.
Powellton & Pocahontas R. R.
4-8½ g. 9 m. 2 lo. 36 cars.
E. Powell, Pres.. ....Powellton, W. Va.
J. R. Thomas, Pur. Agt....Powellton, W Va.
W. T. Layton, M. M......Powellton, W. Va.
C. Dotson, M. C. B........Powellton, W Va.
Prescott & Arizona Cent. Ry. 4-8½ g. 74 m. 3 l. 20c.
Wm. N. Kelly Rec .... Prescott, Ariz.
Tho. S. Bullock, Pres. & G. Man. New York, N.Y.
W. B. Jones, G. S. & P. A Prescott, Ariz.
E. Folliatt, M. M ....Prescott, Ariz.
Prince Edward Island Ry. (See Intercolonial Ry).
Profile & Franconia Notch R. R.
(See Concord & Montreal R. R.)
Prov. & Springfield R.R. Leased to N.Y. & N.E.R.R.
Pullman Palace Car Co. 2,573 passenger cars.
Geo M. Pullman, Pres............Chicago, Ill.
Horace Porter, V. Pres.......New York, N. Y.
T. H. Wickes, 2d V. Pres ......Chicago, Ill.
Geo. F. Brown. Gen. Man... .....Chicago, Ill.
Wm. A. Angell, West'n Pur. Agt..Chicago, Ill.
S.W. Bretzfield, East'n Pur. A..New York, N.Y
H. Middleton, Manager Pullman Works,
Pullman, Ill.
H. H. Sessions, Chief Mech. Eng. Chicago, Ill.

Q

Quebec & Lake S. John Ry. 4-8½ g. 280 m. 14 l. 314 c.
J. G. Scott, Sec. & Manager .....Quebec, Can.
A. Vallerand, Pur. Agt.... .....Quebec, P. Q.
Jno. Campbell, M. M.............Quebec, P. Q.
Quebec Central Ry. 4-8½g. 158m. 12 lo. 406 cars.
Frank Grundy, Gen. Man...Sherbrooke, P. Q.
A. H. Anderson, P. A.......Sherbrooke, P. Q.
Jas. Seiveright, M. M. & M. C. B. Sherbrooke, P. Q.
Queen & Crescent Route.
4-8½ g. 1,158 m. 267 l. 10,460 c.
Richard Carroll, Gen. Man.......Cincinnati, O.
G. W. Stevens, Pur. Agt.........Cincinnati, O.
J. P. McCuen, M. M. & M. C. B..Ludlow, Ky
C., N. O. & T. P.: 4-8½ g. 336 m. 104 l. 3,956 c
S. M. Felton, Pres. & Rec.... Cincinnati, O.
A. Griggs, Supt.............Somerset, Ky.
J. W. Fowle, M. M............Somerset, Ky.
P. H. Schreiber, M. M.....Chattanooga, Tenn.
Ala. Gr. So. Div.: 4-8½ g. 295 m. 59 l. 3,662 c.
A. J. Frazier, Supt.........Birmingham, Ala.
J. B. Skinner, M. M..... ...Birmingham, Ala.
N. O. & N. E. Div. 4-8½ g. 196 m. 44 l. 1,645 c
D. D. Curran, Supt.......... New Orleans, La.
J. G. Tomlinson, M. M.......Meridian, Miss.
Ala. & Vicks. Div. 4-8½ g. 142 m. 14 l. 504 c.
W. W. Bond, Supt........... Vicksburg, Miss.
J. G. Tomlinson M. M.. ...... Meridian, Miss
V. S. & P. Div. 4-8½ g. 189 m. 16 l. 693 c.
W. W. Bond, Supt ....Vicksburg, Miss.
John H. Murphy, M. M.... . ....Monroe, La.
Eastern Ohio R. R.: 4-8½ g. 19 m. 2 lo. 205 cars.
W. H. Stevens, Supt. & P. A. Cumberland, O.
J. W. Gregg, M. M..... ......Cumberland, O.
Quincy, Omaha & Kan. City Ry. 4-8½g. 136m. 9 l. 142c.
J. M. Savin, Gen. Man..............Quincy Ill.,
C. E. Soule, Supt. & Pur. Agt....Quincy, Ill.
J. Voorhis, M. M. & M. C. B......Quincy, Ill.

R

Raritan River R. R. 4-8½ g. 19 m. 3 lo. 31 c.
Frank H. Earle, Pres. & G. M. Jersey City, N.J.
F. Hoffman, Supt........South Amboy, N. J.
C. H. Sisson, P. A ....Jersey City, N J.
Raleigh & Western Ry. Co.
4-9 g. 92 m. 1 lo. 28 cars.
S. A. Henszey, G. M. & P. A...Egypt, N. C.
C. F. Pendleton, Act. Supt.... ..Egypt, N C.
Richmond & Danville R. R. Co.: (See Southern Ry.)
Richmond & Petersburg R.R. (See A l. Coast Line.)
Richmond, Fredericksburg & Potomac R. R.
4-9 g. 81 m. 22 lo. 110 cars.
T. L. Courtney, Supt. & Pur. A. Richmond, Va.
J. T. Bryant M. M.............. Richmond, Va.
Richmond, Nicholasville, Irome & Beattyville Ry.
4-8½ g. 61 m. 4 lo. 28 cars.
John MacLead, Rec............Louisville, Ky.
W. H. Adams, Supt......... Richmond, Ky.
K. MacLeod, P. A............Louisville, Ky.
John Farrell, Gen. Fore.......Richmond, Ky.
Rio Grande Western Ry.
4-8½ g. 531 m. 77 lo. 771 c.
D. C. Dodge, Gen. Man...........Denver, Colo.
W. P. McElroy, P. A.... Salt Lake City, Utah.
Quimby Lamplugh, M.M. Salt Lake City, Utah.
Rock Island & Peoria Ry. 4-8½ g. 113 m. 19 l. 530 c.
H. B. Sudlow, Supt. & P. A....Rock Island, Ill
Joseph Elder, M. M. & M.C. B......Peoria, Ill.
Rome, Watertown & Ogdensburg R. R. N. Y. C. & H. R. R. R. Lessee. 100 lo. 3,934 cars.
J. M. Torrey, Gen. Man. ..New York, N. Y.
E. G. Russell, Supt ....Watertown, N. Y
Allan Bourn, Pur. Agt.......New York, N. Y.
Wm. Buchanan, S. M. P. R. S...New York, N.Y
P. T. Lonergan, M. M..........Oswego, N. Y.

S

Sabine & East Texas Ry. (See So. Pac.
Saginaw, Tuscola & Huron R.R.
4-8½ g. 67 m. 9 l. 189 c.
Sanford Keeler, G. M. & P. A., Saginaw, Mich.
Wm. L. Kerr, Gen. For.....E. Saginaw, Mich.
Saginaw Valley & St. Louis R.R. (Det. Lan. & North'n.)
St. Augustine & South Beach Ry. 3 g. 5 m. 2 l. 2 c.
Allen Wood, Gen. Man. & P. A.,
St. Augustine, Fla.
W. J. Mack, M. M............Anastasia, Fla.
St. Johns & Lake Eustis Ry.
3 g. 52 m. 1 lo. 1 car.
C. P. Lovell, Rec. & Gen. Man. Leesburg, Fla.
P. L. McAteer, Pur. Agt. ....Leesburg, Fla.
D. B Young, M. M...............Leesburg, Fla.

St. Johnsbury & Lake Champlain R. R.
4-8½ g. 132 m. 18 lo. 340 cars.
H. E. Folsom, Supt...........Lyndonville, Vt.
J. A. Farrington, Pur. Agt .....Boston, Mass.
Henry Bartlett, Supt. M. P.....Boston, Mass.
J. T. Chamberlain, M. C. B......Boston, Mass.
St. Joseph & Grand Island R. R.
4-8½ g. 454 m. 35 lo. 1,450 cars.
W. P. Robinson, Jr., Gen. Man. .St. Joseph, Mo
G. D. Berry, Pur. Agt.........St. Joseph, Mo.
A. C. Hinckley, M. M..... ....St. Joseph, Mo.
St. Louis, Cape Girardeau & Ft. Smith Ry.
4-8½ g. 104 m. 12 l. 120 cars.
E. S. McCarty, Gen. Man. Cape Girardeau, Mo.
Louis Houck, Rec. & P. A. Cape Girardeau, Mo.
A. W. Quackenbush, Supt. of M. & M C.B.
Cape Girardeau, Mo.
St. Louis & Hannibal. 4-8½ g. 104 m. 7 lo. 175 c.
J. A. Jordan, Gen Man. & P. A..Hannibal, Mo.
Wm. P. Reidler, M. M. & C. B..Hannibal, Mo.
St. Louis & San Francisco Ry.
(See A., T. & S. F. R. R.)
St. Louis, Alton & Springfield R. R. (See St. L., C. & St. P. Ry.)
St. Louis, Alton & Terre Haute R.R
4-8½ g. 240 m. 43 lo. 4,267 c.
G. W. Parker, Pres. & G. M....St. Louis, Mo.
C. F. Parker, Pur. Agt ....St. Louis, Mo.
J. W. Stokes, M. M. ..., E. St. Louis, Ill.
St. Louis, Chicago & St. P. Ry. Co.
4-8½ g. 110 m. 15 lo. 1,000 cars.
I. W. Fowler, Gen Supt....... Springfield, Ill
B. L. Babb, Supt. Car Serv ...Jerseyville, Ill.
W. E. Killen, M. M. & M. C. B., Jerseyville, Ill.
St. Louis & Eastern.
4-8½ g, 41 m. (inc. S. L. & P.) 4 lo. 728 c,
Wm. E. Guy, G. M. & P. A....St Louis, Mo.
St. Louis Southwestern Ry. Co.
4-8½ g. 1,223 m. 136 lo 4,465 cars.
J. A. Edson, Supt............Texarkana, Ark.
A. Gould, P. A..................St. Louis, Mo
R. M. Gailbraith, Gen. M. M. Pine Bluff, Ark
St. Louis, Iron Mt. & So'n Ry. (See Mo. Pac.; (4) Div.
St. Louis, Kan. City & Colorado R. R.
4-8½ g. 66 m. 2 l. 52 cars.
Adiel Sherwood, Receiver.....St. Louis, Mo.
E. O. Faulkner, Man. & Pur. A. St. Louis, Mo.
St. L., Keokuk & No.-W'n. Ry. (See C., B. & Q.)
St Paul & Duluth R.R. 4-8½ g. 247 m. 66 lo. 2,249 c.
A. B. Plough, Gen. Man.........St. Paul, Minn.
W. N. Schoff, Pur. Agt..... ....St. Paul, Minn
G. D. Brooke, M. M. & M. C. B...St. Paul, Minn
Salisbury & Harvey Ry. 4-8½ m. 52 m 2 lo. 35c.
A. Sherwood, G. S. & P. A....Hillsboro, N. B.
San Antonio & Aransas Pass Ry.
4-8½ g. 687 m. 60 lo. 1,543 cars.
M. D. Monserrate, Gen. Man. San Antonio, Tex.
T. B. Palfrey, P. A. .... San Antonio, Tex.
G. W. Butcher, M. M........San Antonio, Tex.
San Diego, Cuyamaca & Eastern Ry.
4-8½ g. 26 m. 2 lo. 39 cars.
W. S. Waterman, G. M.......San Diego, Cal.
Sandy River R. R. 2 g. 18 m. 4 lo. 35 cars.
Josiah Maxey, G. M..............Gardiner, Me.
P. H. Winslow, Pur. Agt ......Gardiner, Me.
E. Greenwood, M. M. & C. B......Phillips, Me.
Sandusky & Columbus Short Line.
(See Col. S. & H. Ry. Co.)
Sanford & St. Petersburg R.R. (See Plant System)
San Francisco & No. Pac. Ry.
4-8½ g. 165 m. 18 lo. 538 cars.
H. C. Whiting, G. M. & P. A. San Francisco, Cal
John Bonner, M. M ....Tiburon, Cal.
J. P. Samuelson M. C. B. ....Tiburon, Cal.
San Pete Valley R. R. 3 g. 51 m. 3 lo. 45 cars.
T. Bruback, Gen. Man....Salt Lake City, U. T.
H. S. Kerr, Supt. & P. A..Salt Lake City, Ut.
Wm. Watson, M. M ....Salt Lake City, Ut.
C. W. Wood, M. C. B......Salt Lake City, Ut.
Santa Fe Southern Ry. 3 g. 40 m. 3 lo. 42 cars.
T. J. Helm, Gen. Man. ....Santa Fe, N. Mex.
Santa Fe, Prescott & Phoenix Ry. Co.
4-8½ g. 60 m 8 lo. 91 cars.
F. M. Murphy, Pres. & G. M...Chicago, Ill.
W. L. Wallace, Supt. M. P., M. & R. S.,
Prescott, Ariz.
Sault Ste. Marie & Northwestern R. R. (See Chi. St. P. Minn. & Omaha Ry.)
4-8½ g. 28 m. 2 lo. 15 cars.
Savannah, Americus & Montgomery.
4-8½ g. 300 m. 26 lo. 1,314 cars.
Cecil Gabbett, Gen. Man. & Pur. Agt.
Americus, Ga.
J. E. Worsick, M. M. & M.C.B. Americus, Ga.
Savannah, Florida & W'n Ry. (See Plant System.
Sav., Griffin & No. Ala. R. R. Op. by Central (Ga.)
Seaboard Air Line, operating
Seaboard & Roanoke, Roanoke & Tar River, Raleigh & Gaston, Raleigh & Augusta Air Line, Carolina Central, Durham & Northern and Georgia, Carolina & Northern Railroads.
Seaboard Air Line. 4-9 g. 927 m. 128 l. 2,215 c.
E. St. John, V. P......... Portsmouth, Va.
Jno. H. Winder, Gen. Man...Portsmouth, Va.
W. J. Edwards, Pur. Agt...Portsmouth, Va.
D. W. Ballantine, M. C. B....Portsmouth, Va.
James Maglenn, Supt. M. P. & M. Raleigh, N. C.
C. B. Royal, M. M.... ...... Portsmouth, Va.
Seaboard Ry. of Alabama. 3 g. 31 m. 6 lo. 140 c.
W. Best, G. M. ....New York, N. Y.
J. Penney, M. M. & M. C. B....Fairfield, Ala.
Seattle, Lake Shore & Eastern Ry. (See Northern Pacific Co.)
Seattle & Northern Ry. (See Ore. Improvem't Co.)
Sharpsville R. R. 4-8¾ g. 23 m. 4 lo. 4 cars.
J. V. Patton, P. & Gen. Man.. ...Pittsburgh, Pa.
S. K. Harris, Pur. Agt........Sharpsville, Pa.
Jas. Glass, M. M ....Sharpsville, Pa.
Shepaug, Litchfield & Northern R. R.
4-8½ g. 38 m. 4 lo. 50 cars.
C. H. Pratt, Supt..........New Haven, Conn.
J. E. Martin, Supt. & Pur. A. Litchfield, Conn.
A. J. Broughel. M. M. & M. C. B. Hawleyville, Ct.
Sherman, Shreveport & Southern Ry.
4-8½ 153 m. 8 lo. 141 cars.
F. W. Fratt, G. M..............Greenville, Tex.
E. M. Alvord, G. S. & P. A .Greenville, Tex.
Jas. Long, M. M. & M. C. B. Greenville, Tex.
Silver Lake Ry. Co. 4-8½ g. 7 m. 1 lo. 520 cars.
C. A. Carmichael, Supt............Perry, N. Y.
John A. Dalziel, Pur. Agt...Rochester, N.Y.
Silver Springs, Ocala & Gulf R. R.
(See Plant System.)
Sioux City, O'Neill & Western Ry.
4-8½ g. 129 m. 6 lo. 355 cars.
F. C. Hills, Receiver & P. A...Sioux City, Ia.
T. Roope, M. M. & M. C. B... Sioux City, Ia.
Sioux City & Northern R. R.
4-8½ g. 97 m. 12 l. 477 cars.
W. Hough, S. J. Beals, } Receivers.
G. W. Oakley, Pur. Agt........Sioux City, Ia
T. Roope, M. M.................Sioux City, Ia.
Sioux City & Pacific and 4-8½ g. 107 m. 11 lo. 370 c
Fremont, Elkhorn & Mo. Val. R. R.
3 and 4-8½ g. 5,030$\frac{78}{100}$ m. 1,010 l. 4,052 cars.
H. G. Burt, Gen. Man........ ..Omaha Neb.
C. H. Haywood, Pur. Agt.. ......Chicago, Ill.
S. A. Teal, M. M......... .Missouri Valley, Ia.
W. H. Ramseyer, M. C. B..Missouri Valley, Ia
Skaneateles R. R. 4-8½ g. 5 m. 2 lo. 6 cars.
J. McNamara, Man., Supt. & Pur. Agt.
Skaneateles, N. Y.
M. Fennell, M. M. & M. C. B. Skaneateles, N. Y.
Somerset Ry. 4-8½ g. 42 m. 6 lo. 52 cars
W. M. Ayer, Supt & Pur. Agt......Oakland, Me
C. Crowell, M. M.................Oakland, Me
S. P. Mosher, M. C. B.... .Oakland, Me
Sonora Ry. (See A., T. & Santa Fe R. R.)
South Atlantic & Ohio R. R. 4-9 g. 71 m. 10 l. 321 c.
John. C. Haskell, Pres. & Rec....Bristol, Va.
John R. King, M. M. & M. C. B.....Bristol, Va.
South Carolina & Georgia R. R.
4-9 g. 270 m. 45 lo. 1,464 cars.
E. S. Bowers, Gen. Man.. ....Charleston, S.C.
Ed. Parsons, Pur. Agt.......Charleston, S. C.
James Meehan, M. M. & M. C. B. Charleston, S. C
Southern California Ry. (See A., T. & S. F. Ry.)
Southern Pacific Company and proprietary lines;

4-8½ and 3 ft. g. 144.20 m. 3 ft., 6,496.80 4-8½ 962 lo. 25,051 cars.
A. N. Towne, Gen. Man. Pacific System,
San Francisco, Cal.
R. P. Schwerin, Pur. Agt....San Francisco, Cal.
J. Kruttschnitt, Gen. Man....Atlantic System,
Henry J. Small, Supt. M. P. & M. Sacramento, Cal.
Benj. Welch, M. C. B..........Sacramento, Cal.
Pacific System
Western Div.:
A. D. Wilder, Supt....... Oakland Pier, Cal.
Wm. McKenzie, M. M. ....Oakland, Cal
W. B. Ludlow, M. C. B.... ....Oakland, Cal.
R. E. French, M. M. ....Bakersfield, Cal.
Sacramento Div.: J. B. Wright, Supt. Sa'mento, Cal.
T. W. Heintzleman, M. M..Sacramento, Cal.
Salt Lake Div. J. Alger, Supt....Ogden, Utah.
E. M. Luckett, Act. M. M. .Terrace, Utah.
Coast Div.:
J. L. Frazer, Supt....... San Francisco, Cal.
P. Sheedy, M. M. & M. C. B. San Francisco, Cal.
Stockton Div:
W. W. Prugh, Supt.................Lodi, Cal.
M. J. Crosby, M. M.......Stockton Wharf, Cal.
Yuma Div.:
J. A. Muir, Supt .... Los Angeles, Cal.
Geo. Gregg, M. M.. ....Los Angeles, Cal.
Tucson Div.:
J. S. Noble, Supt.................Tucson, Ariz
R. W. Gray, M. M.. ....Tucson, Ariz
Shasta Div.: H. Cooley, Supt....Dunsmuir, Cal.
A. D. Kilborn, M. M..........Dunsmuir, Cal.
Oregon and Sacramento Div.:
L. R. Fields, Supt.............Portland, Ore.
T. W. Younger, M. M.........Portland, Ore.
Southern Ry. Co.
4 ft. 9 in. g. and 3 ft. 4,332 m. 621 lo. 18,899 c.
W. H. Baldwin, Jr., 3d V.-Pres. Wash'ton, D.C.
W. H. Green, Gen. Supt.... Washington, D. C.
J. P. Minetree, Pur. Agt.... Washington, D. C.
R. D. Wade, Supt. M. P......Washington, D.C.
W.H.Thomas, Asst. Supt. M. P. Wash'ton, D.C.
First Division:
N. J. O'Brien, Supt...............Danville, Va.
W. H. Owens, M. M........ Manchester Va.
C. F. Thomas, M. M........ Alexandria, Va.
Second Division:
W. B. Ryder, Supt ....Charlotte, N. C.
C. W. Lee, M. M...............Salisbury, N. C.
W. A. Walden, M. M..... ....Atlanta, Ga.
Third Division:
E. Berkeley, Supt.............Columbia, S. C.
J. H. Green, M. M..............Columbia, S. C.
Fourth Division:
F. K. Huger, Supt ....Knoxville, Tenn.
J. B. Michael, M. M. ....Knoxville, Tenn.
Fifth Division:
W. R. Beaupre, Supt.............Atlanta, Ga.
W. H. Hudson, M. M.............Atlanta, Ga.
Sixth Division:
J. N. Ross, Supt..............Birmingham, Ala.
W. L. Tracy, M. M.... ....Birmingham, Ala.
W. A. Stone, M. M..............Selma, Ala.
Seventh Division (Southern Ry. in Ky.)
G. R. Layall, Supt ....Louisville, Ky.
V. B. Lang, M. M.............Louisville, Ky.
Southwestern Ry. 3 g. 35 m. 4 lo. 55 cars.
L. E. Barker, S. & P. A. Green Cove Springs, Fla.
J. F. Lowe, M. M..Green Cove Springs, Fla.
South Florida R. R. (See Plant System.)
South Jersey R. R. 4-8½ g. 67 m. 8 lo. 38 cars.
Francis I. Gowen, Receiver..Cape May, N.J.
Henry Wood, Man........... Cape May, N. J.
C. T. Kensil, P. A......... Philadelphia, Pa.
Spokane Falls & Northern R.R. Co
4-8½ g. 191 m. 8 lo. 304 cars.
D. C. Corbin, Gen. Man...... Spokane, Wash.
O. D. Mott, Pur. Agt ....Spokane, Wash.
C. H. Prescott, M. M. & C. B..Spokane, Wash.
Staten Island Rapid Transit R.R.
4-8½ g. 30 m. 18 l. 103 cars.
Frank S. Gannon, Gen. Man... ....New York
W. H. Lewis, Pur. Agt.............New York.
Thos. Tyrrell, M. M............. Clifton, S. I.
Stewartstown R.R. 4-8¾ g. 7 m. 1 lo. 3 cars.
M. W. Bahn, Gen. Man....Stewartstown, Pa.
W. H. Fulton, G.S. & P.A. .Stewartstown, Pa.
J. B. Kennedy, M. M. ...... Stewartstown, Pa.
Stony Clove & Catskill Mountain R. R. (See Ulster & Delaware).
3 g. 14 m. 2 lo. 19 cars.
Stuttgart & Arkansas River Ry.
4-8½ g. 40 m. 2 lo. 4 cars.
C. K. Leslie, Gen. Man........Stuttgart, Ark.
Suffolk & Carolina Ry. 3-6 g. 40 m. 4 lo. 107 cars.
J. H. Macleary, G. Man., Pur. A., Supt. & M. M.
Suffolk, Va.
Sumter Valley Ry.
3 g. 25 m. 4 lo. 70 cars.
David Eccles, Gen. Man......Baker City, Ore.
J. A. West, Supt. & P. A.... Baker City, Ore.
F. W. Shurtliff, M. M. & M. C. B. Baker City, Ore.
Syracuse, Geneva & Corning. (See Fall B. Coal Co).

T

Tennessee Midland Ry.: 4-8½ g. 135 m. 7 lo. 187 c
(See Paducah, Tenn. & Ala.)
Terminal Ry. Association of St. Louis: 4-8½g.
Joseph Ramsey, Jr., Gen. Man. St. Louis, Mo.
H. M. Smith, M. M............. St. Louis, Mo.
J. E. Williams, P. A........... St. Louis, Mo.
Terre Haute & Indianapolis R. R.
Vandalia Line.
4-9 g. 688 m. 153 lo. 4,198 cars.
J. G. Williams, Gen. Man..Terre Haute, Ind.
C. R. Peddle, Pur. Agt.......Terre Haute, Ind.
Geo. H. Prescott, S. M. P. & M...Terre Haute, Ind.
Wm. R. McKeen, Jr., M. C. B. Terre Haute, Ind.
Texarkana & Ft. Smith Ry.:
4-8½ g. 36 m. 4 lo. 40 c.
W. S. Taylor, Pres. & P. A...Philadelphia, Pa.
W. A. Williams, Gen. Man..Texarkana, Tex.
J. T. Romack, M. C. B........Texarkana, Tex.
Texas Central Ry. 4-8½ g. 187 m. 10 l. 237 cars
C. Hamilton, Gen. M. & P. A.....Waco, Tex.
F. H. Dehn, M. M...... Walnut Springs, Tex
P. T. Mooney, M. C. B.. Walnut Springs, Tex.
Texas Midland Ry.
4-8½ g. 75 m. 4 lo. 120 c.
E. H. R. Green, G. M. & Pur. A...Terrell, Tex.
B. Hanson, M. M. & M. C. B....Terrell, Tex.
Texas & N. Orleans R. R. (See So. Pac.)
Texas & Pacific R.R. 4-8½ g. 1,499 m. 193 l. 4,459c.
L. S. Thorne, Gen. Man.... ......Dallas, Tex.
A. Gould, Pur. Agt...............St. Louis, Mo
J. W. Addis, S. M. P.. ....Marshall, Tex.
W. D. Minton, M. C. B.. ....Marshall, Tex.
Texas, Sabine Valley & Northwestern Ry.
4-8½ g. 40 m. 3 lo. 28 cars.
R. J. Evans, G. M., G.S. & P.A. Longview, Tex.
T. M. Berry, M. M. & M. C. B...Longview, Tex.
Texas Trunk R. R. 4-8½ g. 51 m. 2 lo. 64 cars.
G. T. Atkins, Rec..................Dallas, Tex.
C. H. Burns, M. M. ....Houston, Tex.
Jas. McGee, M. C. B............Houston, Tex.
Tionesta Valley R. R 3 g. 55 m. 5 l. 223c.
Isaac Horton, Gen. Man......... Sheffield, Pa.
Jerry Crary, G. S., P. A., M. M. & M. C. B.,
Sheffield, Pa.
A. H. Bailey, Pur. Agt..........Sheffield, Pa.
Toledo, Ann Ar. & No. Mich. Ry.
(See Ohio Central Lines).
Toledo & Ohio Central Ry. (See Ohio Cent. Lines.
Toledo, Peoria & Western Ry.
4-9g. 248 m. 40 l. 925 c.
Ed. F. Leonard, Gen. Man..........Peoria, Ill.
E. N. Armstrong, P. A............Peoria, Ill.
B. Warren, M. M. & M. C. B. ......Peoria, Ill.
Toledo, St. Louis & Kan. City R. R.
4-8½ g. 451 m. 87 lo. 3,697 c.
R. B. F. Pierce, Rec........Indianapolis, Ind.
A. L. Mills, Pur. Agt. & Supt......Toledo, O
Frank Pease, Supt. M. P........Frankfort, Ind.
J. Teufer, M. C. B..............Frankfort, Ind.
Tuckerton R. R. 4-9 g. 29 m. 3 lo. 23 car.
John C. Price, S., P. A., M. M. & M. C. B.,
Tuckerton, N. J.

U

Ulster & Delaware R. R. 4-8½ g. 87 m. 17 lo. 302 cars
A. E. Benson, *G. Supt. & P. A.*..Rondout, N. Y.
A. W. Belcher, *M. M.*.....Rondout, N. Y.
John H. Decker, *M. C. B.*.....Rondout, N. Y.
Union Pacific Ry. (8 Gen. Divs.)
4-8½ g. 4,469.3 m. } 1,057 lo. 27,038 cars.
3 g. 448 m. }
S. H. H. Clark, Oliver W. Mink, E. I. Ellery Anderson, John W. Doane, Fred. R. Coudert, *Receivers*.....Omaha, Neb.
E. Dickinson, *Gen. Man.*.....Omaha, Neb
J. W. Griffith, *Pur. Agt* .....Omaha, Neb.
J. H. McConnell, *Supt. M. P.*.....Omaha, Neb
Neb. Div.:
P. J. Nichols, *Gen. Supt.*.....Omaha, Neb
J. H. Manning, *M. M.*.....Omaha, Neb.
A. M. Collett, *Gen. Car For.*.....Omaha, Neb
Wyo. Div.
T. A. Davies, *M. M.* .....Laramie, Wyo.
Utah Div.:
J. H. Young, *Supt.*.....Salt Lake City, Utah.
D. Patterson, *M. M.*...Salt Lake City, Utah.
Col. Div.: P. Touhy, *Supt.*.....Denver, Co.
J. P. Bay, *M. M.*.....—Denver, Col.
J. W. Blackburn, *For. Car Reps.*, Denver, Col.
Idaho Div.: H. E. Van Housen, *Supt.*, Pocatello, Id.
J. F. Dunn, *M. M.*.....Pocatello, Id.
Kan. Div.: J. O. Brinkerhoff, *Supt.* Kan. City, Mo.
F. Mertsheimer, *M. M.* ...Armstrong, Kan
Union Tank Line Co. 6.600 cars.
J. Howard Wright, *Pur. Agt*, New York, N. Y.
C. A. Smith, *M. C. B.*.....New York, N. Y
Utah Central Ry.
3 g. 63.6 m. 7 lo. 158 cars.
J. McGregor, *G. M. & P. A.* Salt Lake City, Utah.
J. G. Bywater, *M. M. & M. C. B.* S. L. City, Utah.

V

Valley Ry. (Ohio) 4-8½ g. 76 m. 30 lo. 1,125 cars
N. Monsarrat, *Receiver*.....Cleveland, O.
J. T. Johnson, *Supt.*.....Cleveland, Ohio.
Y. Anderson, *Pur. A.*.....Cleveland, O.
Vermont Valley. (*See Boston & Maine.*)
Vicksburg & Meridian R.R. (*See Queen & Crescent.*)
Virginia & Truckee R. R. 4-8½ g. 52 m. 14 lo. 325 c.
Hume Yerington, *G. M. & P. A.* Carson City, Nev.
I. N. Fording, *M. M.*.....Carson City, Nev.
C. Brulein, *M. C. B.*.....Carson City, Nev.
Virginia Midland Ry. (*See Southern Ry. Co.*)

W

Wabash R.R. 4-8½ g. 2,049 m. 418 l. 13,875 c
Chas. M. Hays, *Gen. Man.*.....St. Louis, Mo.
J. B. Barnes, *Supt. M. P.*.....Springfield, Ill.
M. M. Martin, *Supt. C. D.*.....Decatur, Ill.
H. H. Wellman, *Pur. Agt*.....St. Louis, Mo.
Wabash, Chester & Western R.R.
4-8½ g. 65 m. 4 l. 102 c.
C. B. Cole, *Gen. Man.*.....Chester, Ill.
J. R. Hawkins, *Gen. Supt & P. Agt.* Chester, Ill.
Waco & Northwestern Ry.
4-8½ g. 54 m. 6 lo. 90 cars.
P. A. Gorman, *G. M. & P. A.*.....Waco, Tex.
Wagner Palace Car Co.
W. S. Webb, *Pres*.....New York, N. Y.
J. D. Taylor, *Treas.*.....New York, N. Y.
E. A. Benson, *Manager Buff. Wks.*, Buffalo, N. Y.
Wallkill Valley. 4-8½ g. 38 m. 3 l. 17 c
J. D. Layng, *Gen. Man.*.....New York, N. Y.
A. Bourn, *Pur. Agt*.....New York
Wm. Buchanan, *Supt. M. P*.....New York
J. M. Boon, *Asst. S. M. P.*.....Frankfort, N. Y
Washington & Columbia River Ry. Co.
4-8½ g, 162 m. 7 lo. 67 cars
W. D. Tyler, *Rec., Gen. Man. & Pur. Agt.*, Walla-Walla, Wash.
J. Winslow, *S. M. P.* ...Walla-Walla, Wash.
Washington Southern Ry. Co. 4-8½ g. 75 m. 3 l. 118 c.
J. R. McDonald, *G. M. & S.*...Seattle, Wash
A. Johnson, *Pur. Agt*.....Shelton, Wash.
M. M. & M. C. B...Shelton, Wash.
Waynesburg & Washington R.R. 3g. 29 m. 4 l. 53 c
C. E. Bower, *Supt.*.....Waynesburg, Pa
H. O. Hukill, *Purch. Agt*.....Pittsburgh, Pa
A. M. Kline, *M. M.*.....Waynesburg, Pa
Waycross Air Line Ry. 4-8½ g. 35 m. 5 lo. 30 c.
L. Johnson, *G. M.*.....Waycross, Ga.
F. M. Hawkins, *Pur. Agt* .... Waycross, Ga
John Welch, *M. M.*.....Waycross, Ga,
Western & Atlantic R. R.
(*See Nashville, Chatt. & St. Louis Ry. Co.*)
Western Maryland R. R. 4-8½ g. 222 m. 50 lo. 856 c.
J. M. Hood, *Pr. & Gen. Man* ...Baltimore, Md
H. M. Burgand, *Pur. Agt*.....Baltimore, Md.
David Holtz, *Mast. of Mach.*..Union Bridge, Md
D. E. Little, *M. C. B.*.....Union Bridge, Md.
Balt. & Har'sb'g Div.: H. D. Scott, *Spt.*..Hanover, Pa.
H. S. Reiley, *M. M.*.....Hanover Pa
Western New York & Pennsylvania R.R.
4-8½ and 3 g. 634 m. 149 l. 8,800 c.
S. G. De Coursey, *Receiver*.....Buffalo, N. Y.
Robert Bell, *Gen. Supt*.....Buffalo, N. Y.
J. H. Poole, *Fur Agt*.....Buffalo, N. Y.
Allen Vail, *Gen. M. M.*.....Buffalo, N. Y.
Pitts. Div.: J. P. Heindell, *Supt*.....Oil City, Pa.
P. P. Foller, *M. M.*.....Oil City, Pa.
Roch. Div.: J. W. Watson, *Supt*.....Olean, N. Y
John Magee, *M. M.*.....Olean, N. Y.
West Jersey R. R. (*See Penn. R. R.*); (3) *Div.*
West Shore R. R. (N. Y. C. & H. R. R. R. Lessee.
4-8½ g. 489 m. 220 lo. 8,118 c.
J. D. Layng, *Gen. Man.*.....New York, N. Y.
A. Bourn, *Pur. Agt*.....New York, N. Y.
Wm Buchanan, *Sup. M. P.*...New York, N. Y
Jas. M. Boon, *Asst. S. M. P.*...Frankfort, N. Y.
H. R. Div.: W. G. Wattson, *Supt.*..Weehawken, N. J.
J. Howard, *M. M.*.....New Durham, N. J.
Buff. Div.: C. H. Ketcham, *Supt.*..Syracuse, N. Y.
P. E. Garrison, *M. M* .....E. Buffalo, N. Y
W. Va. Cent. & Pittsb'gh Ry. 4-8½ g. 150 m. 29 lo. 1,806 c.
C. L. Bretz, *Gen. Man.*.....Cumberland, Md.
E. W. S. Moore, *Pur. Agt*.....Cumberland, Md.
J. S. Turner, *Supt. M. P.*.....Elkins, W. Va.
W. Va. & Pittsburgh R. R. 4-8½ g. 160 m. 18 lo. 537 c.
A. H. Kunst, *G. Man. & Pur. A.*..Weston, W. Va.
S. A. Steele, *M. M.*.....Weston, W. Va.
White & Black River Valley Ry. 4-8½ g. 64 m. 41. 87 c.
W. J. Thompson, *Gen. Man. & P. A.*, Little Rock, Ark
W. J. Redding, *M. M.*.....Brinkley, Ark.
L. F. Hill, *M. C. B.*.....Brinkley, Ark.
Wheeling & L. E. Ry. 4-8½ g 249 m. 70 lo. 5.103 c
A. G. Blair, *G. M.*.....Toledo, O.
F. S. Deal, *P. A.*.....Toledo, O.
W. H. Stark, *M. C. B.*.....Toledo, O.
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Y

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Z

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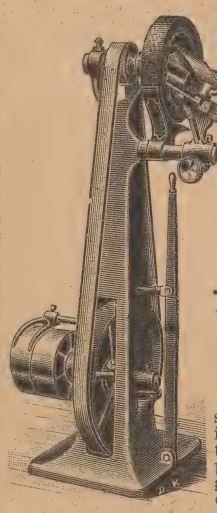

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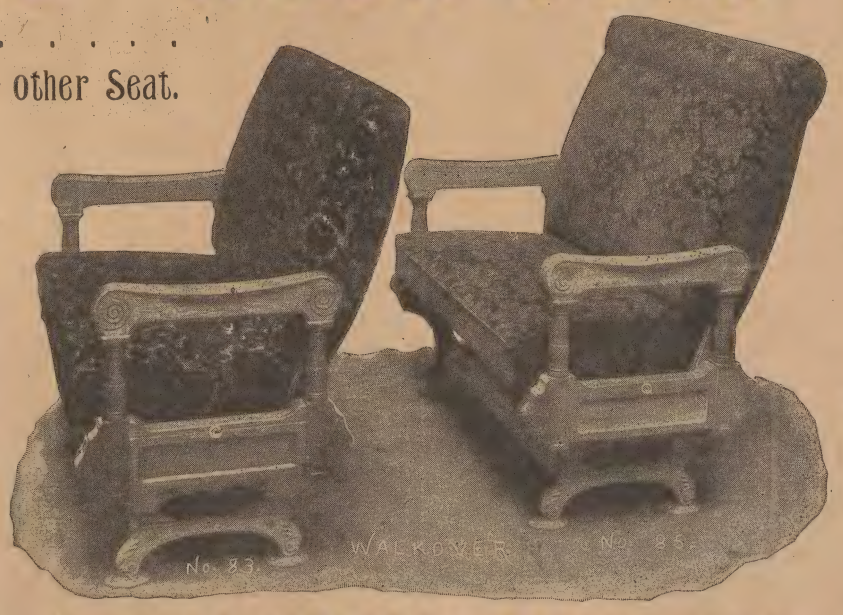

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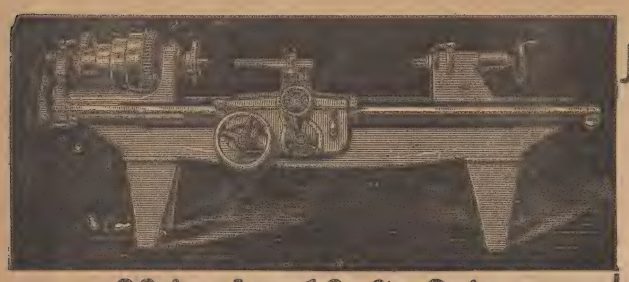

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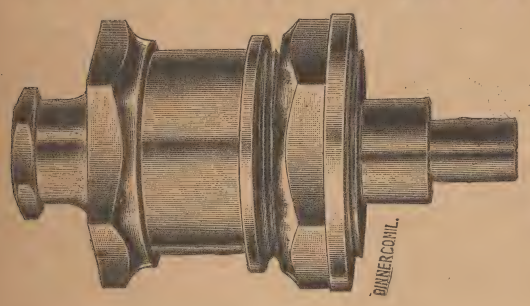

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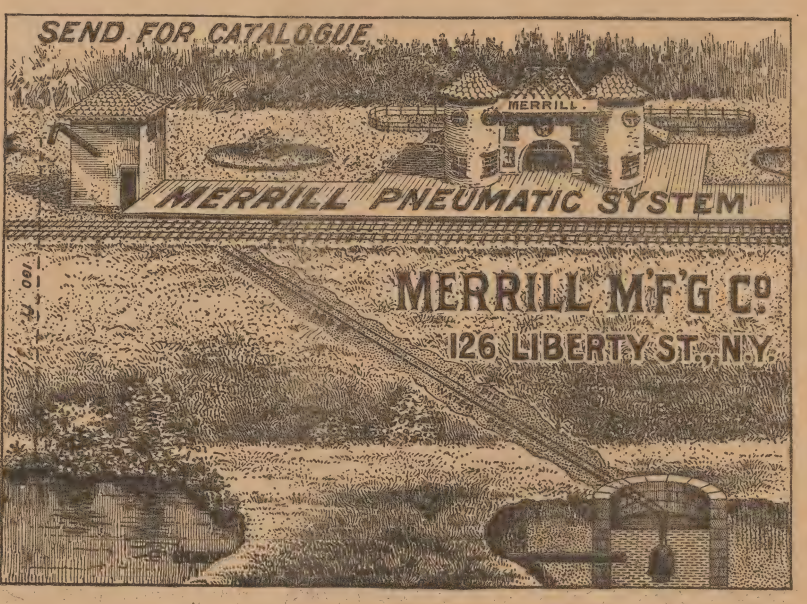

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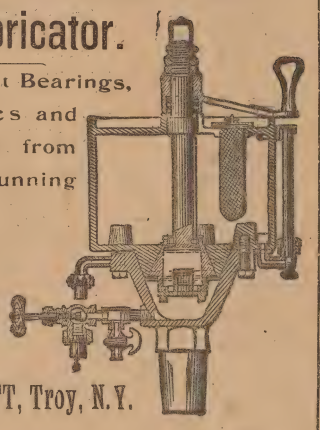

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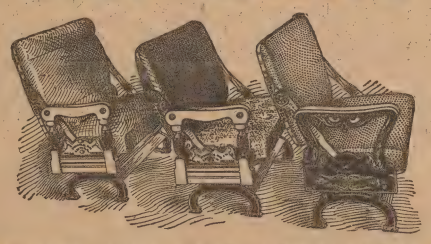

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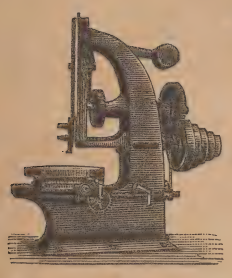

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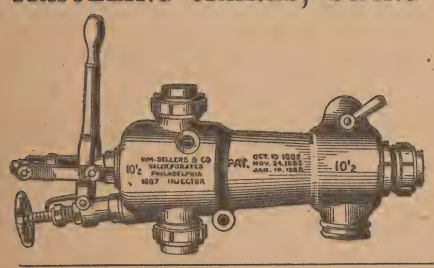

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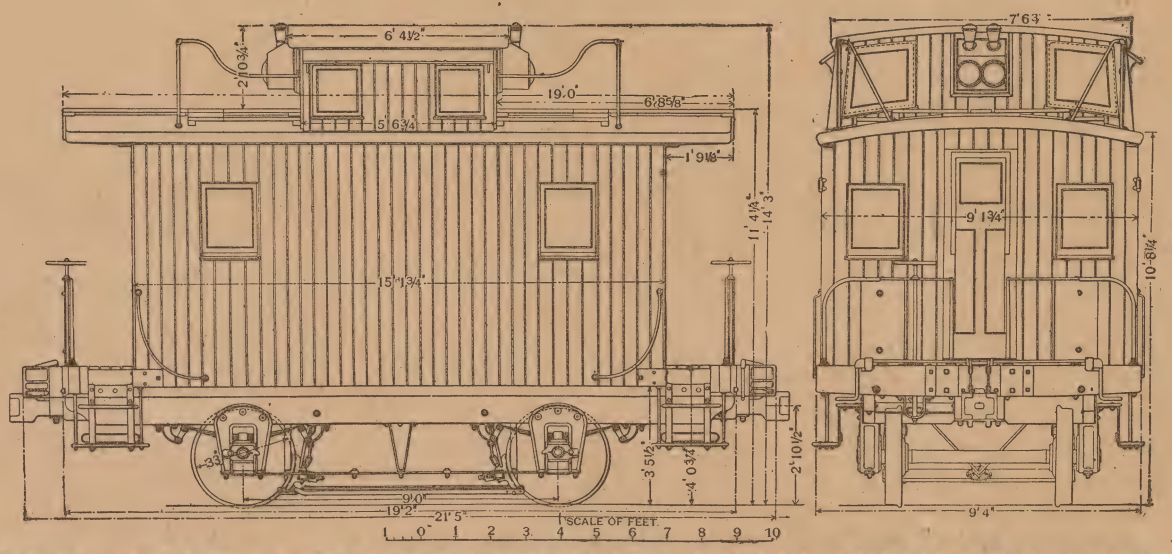

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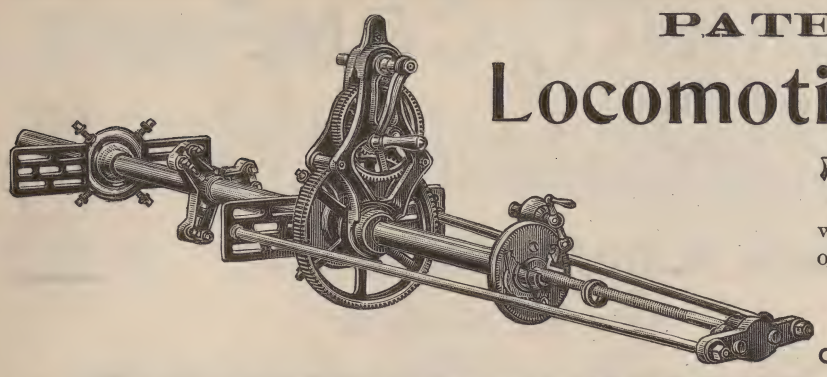

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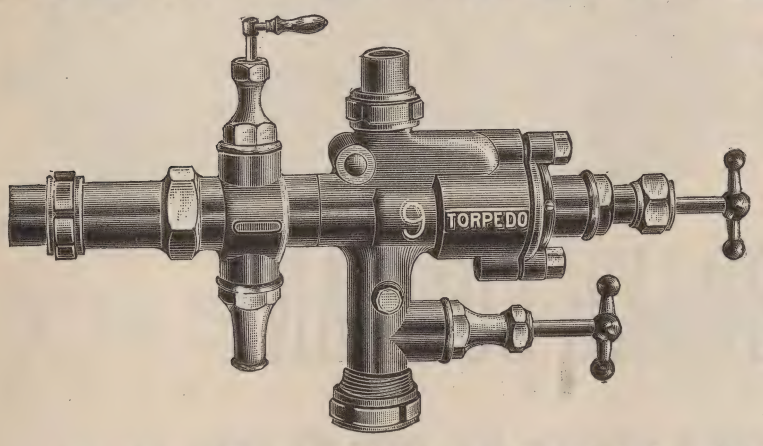

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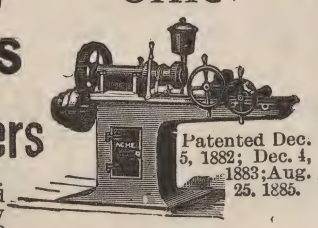

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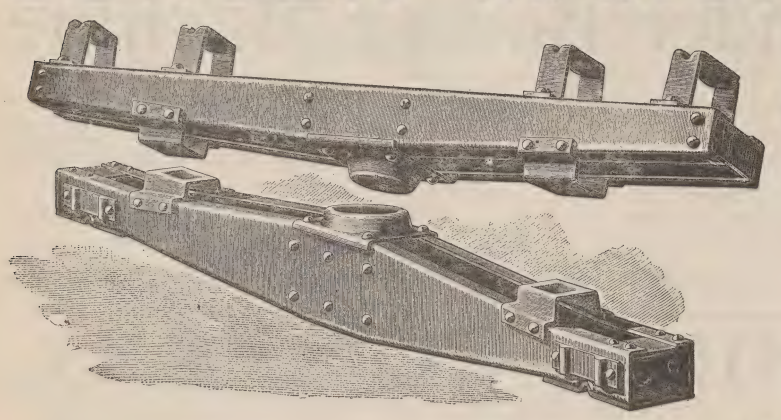

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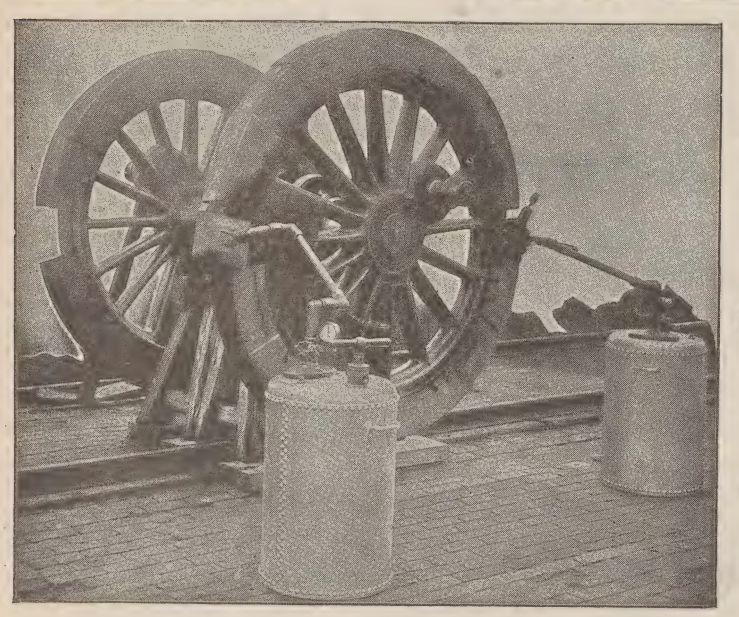

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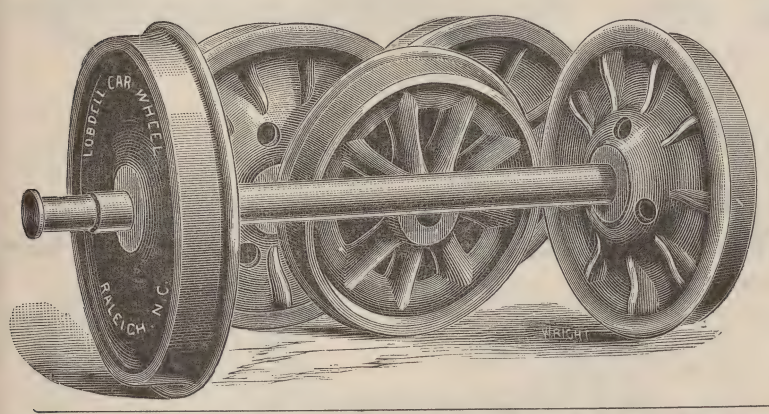

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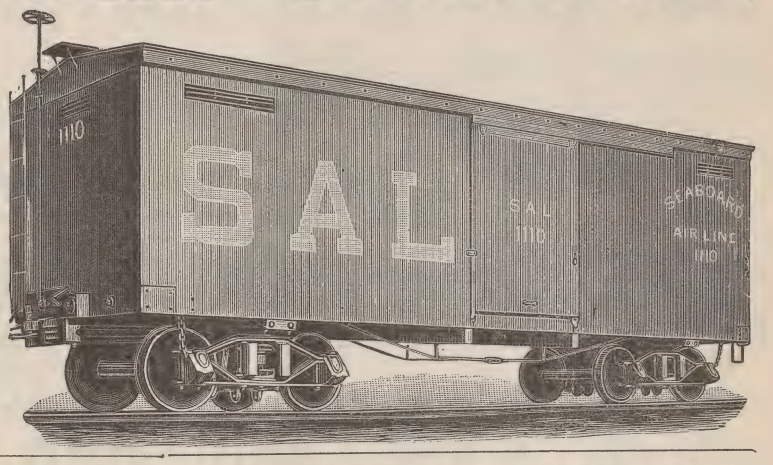

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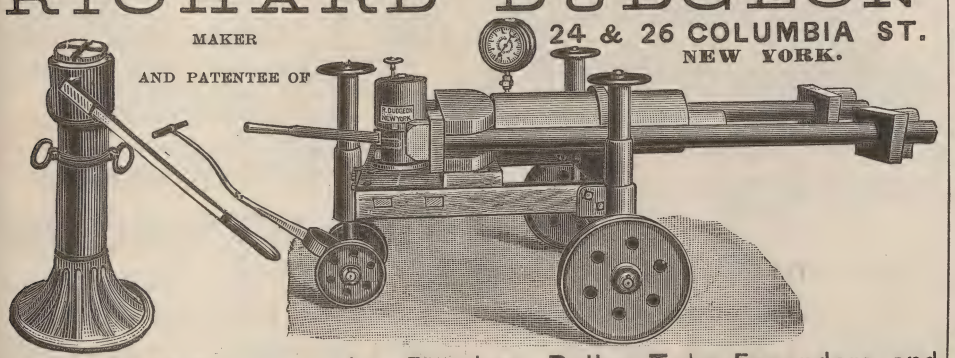

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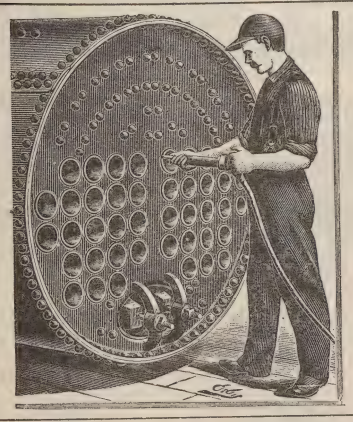

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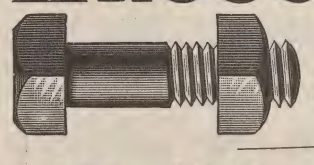

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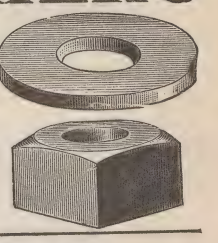

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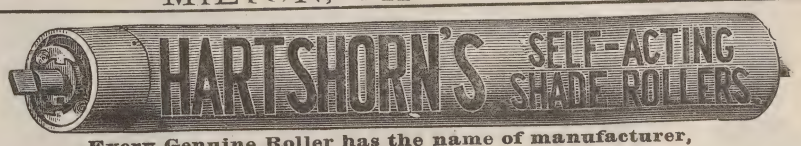

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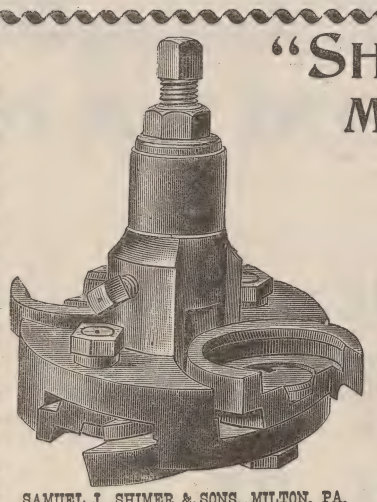

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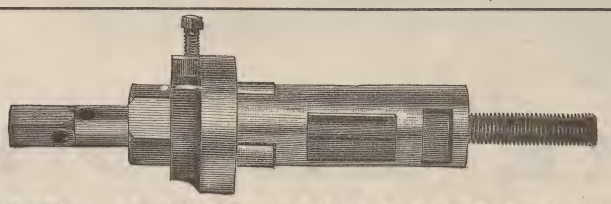

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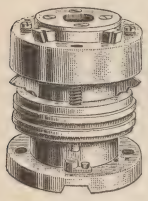

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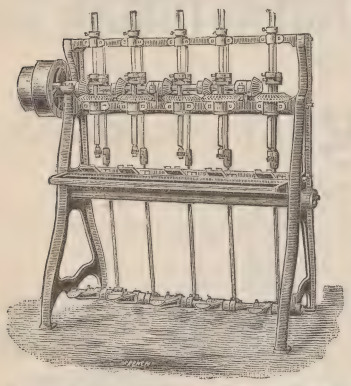

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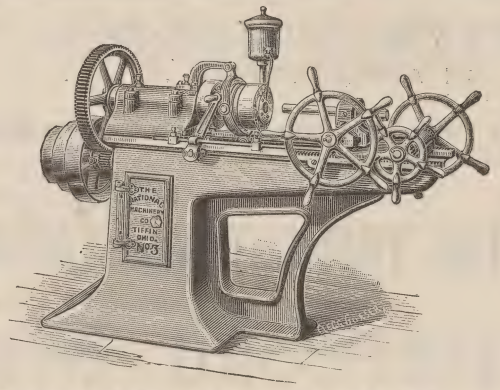

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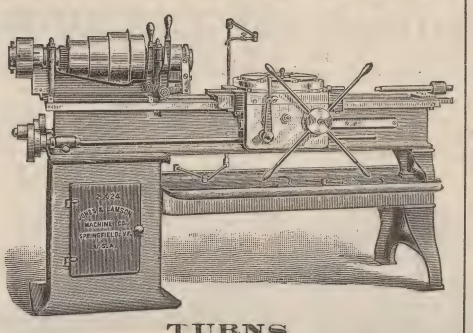

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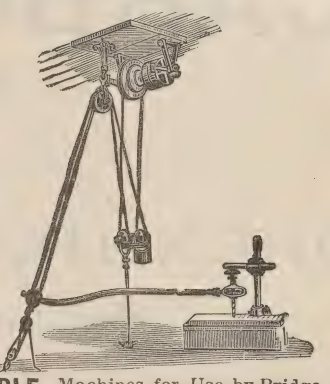

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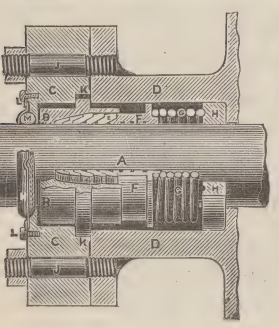

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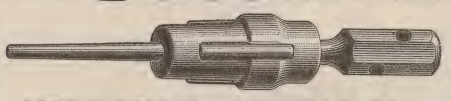

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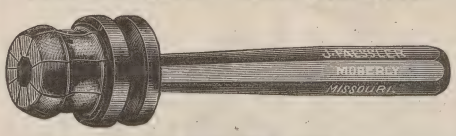

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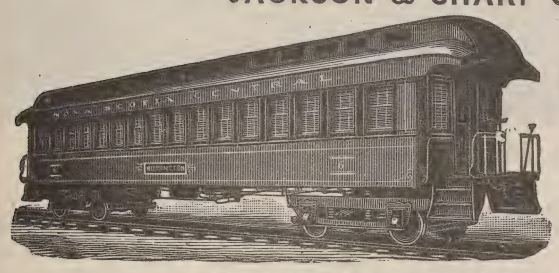

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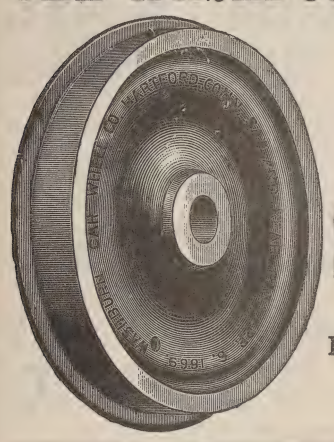

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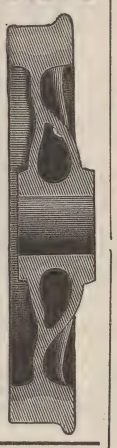

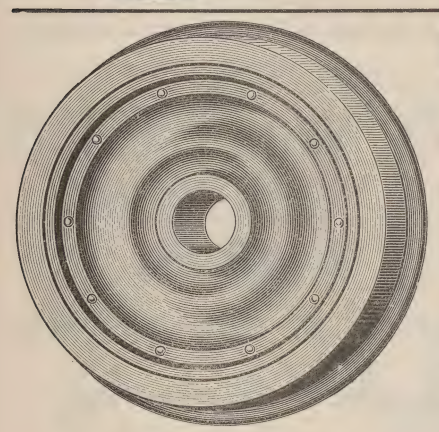

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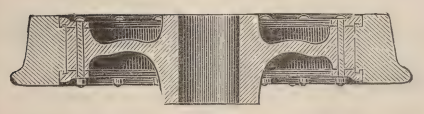

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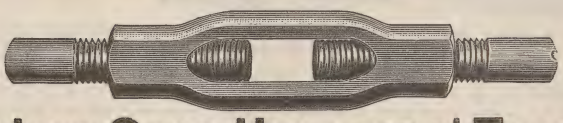

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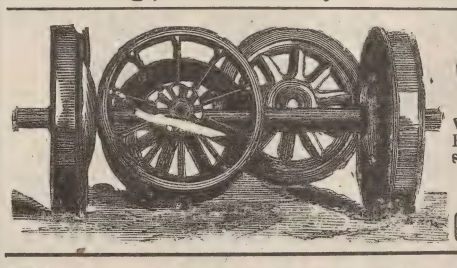

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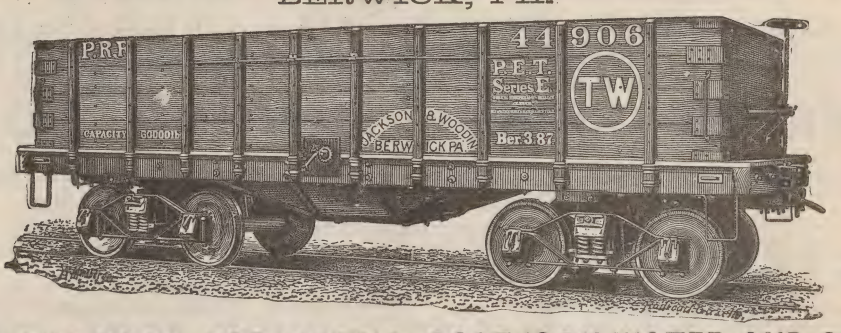

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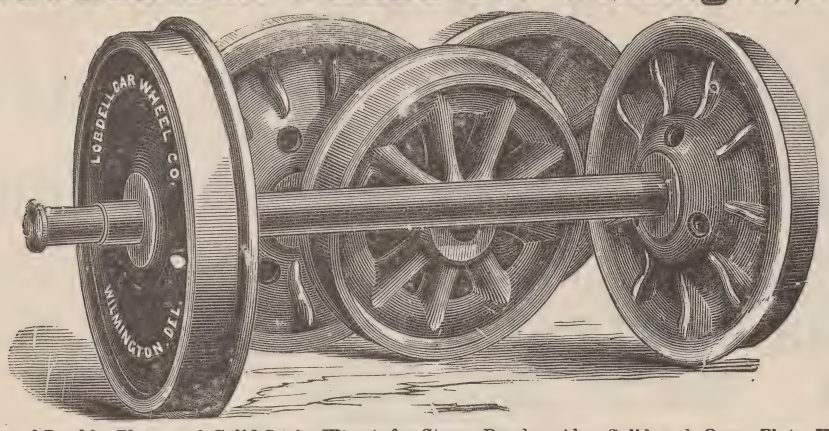

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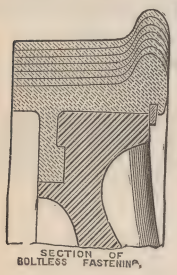

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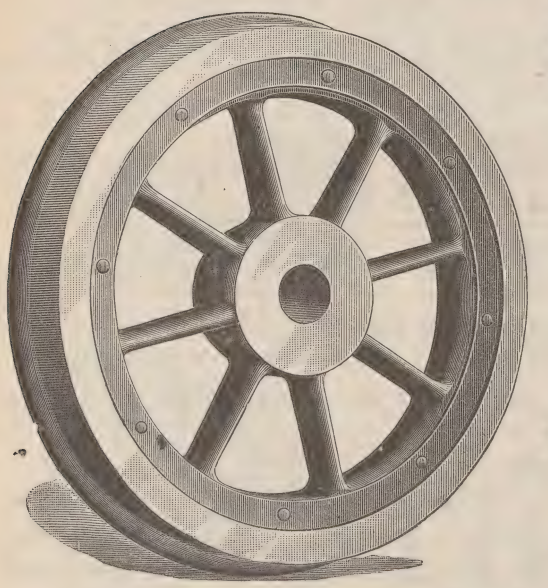

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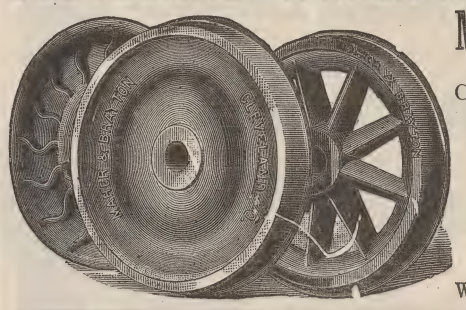

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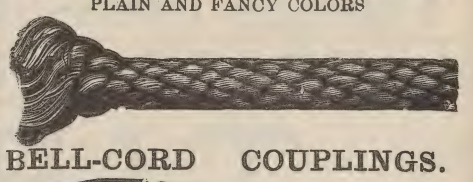

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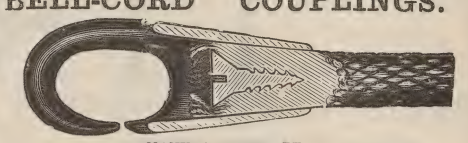

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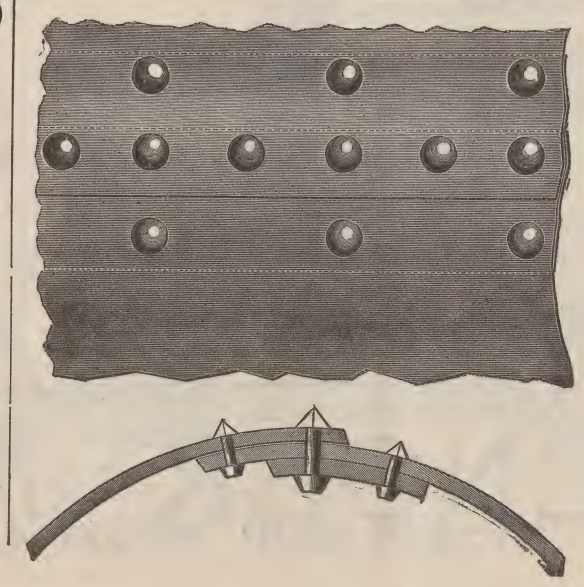

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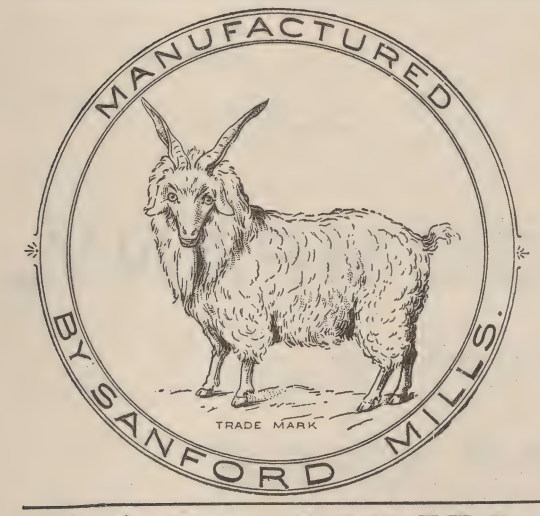

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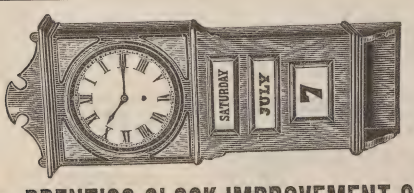

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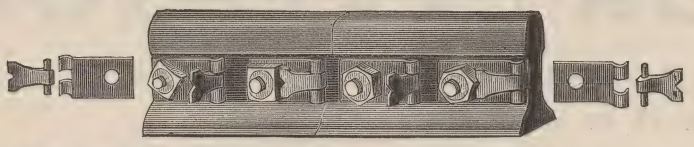

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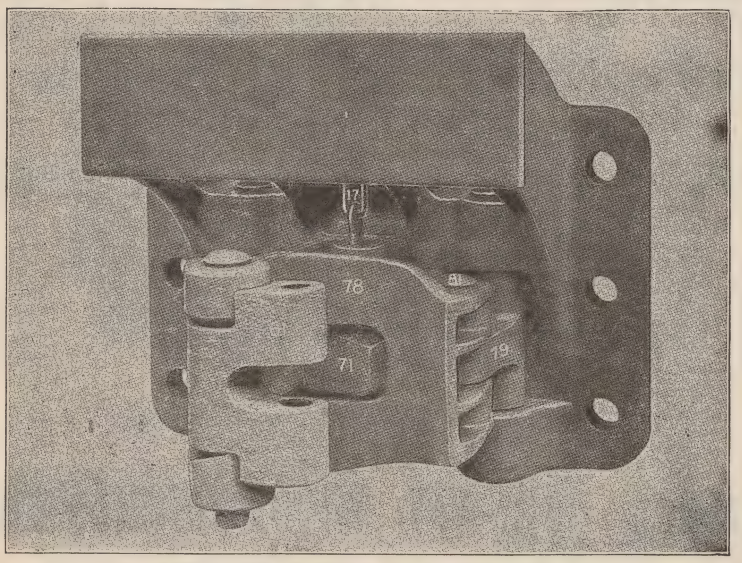

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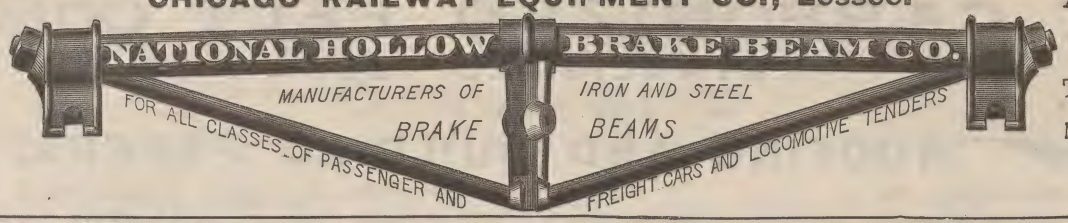

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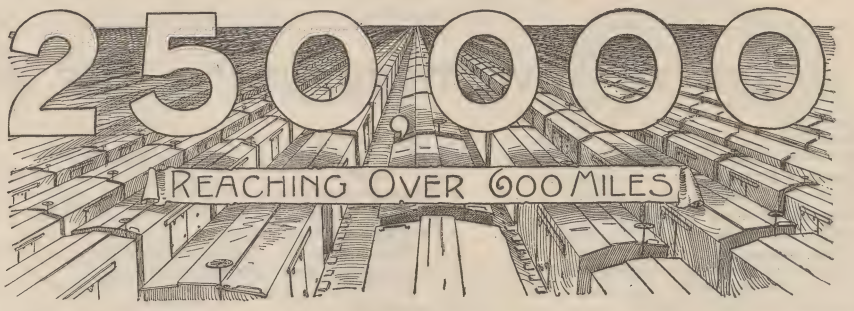

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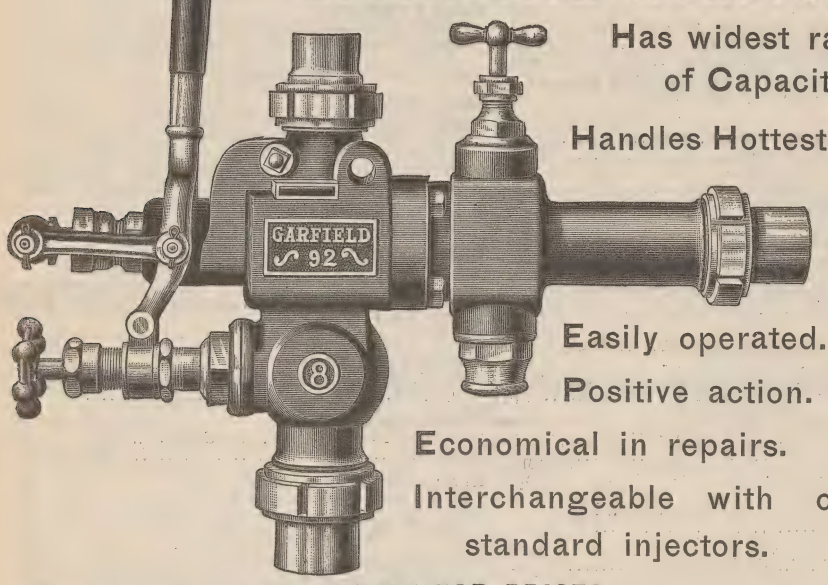

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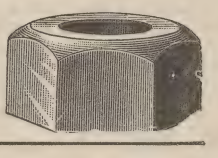

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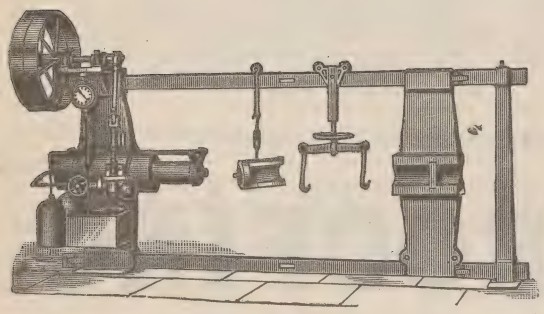

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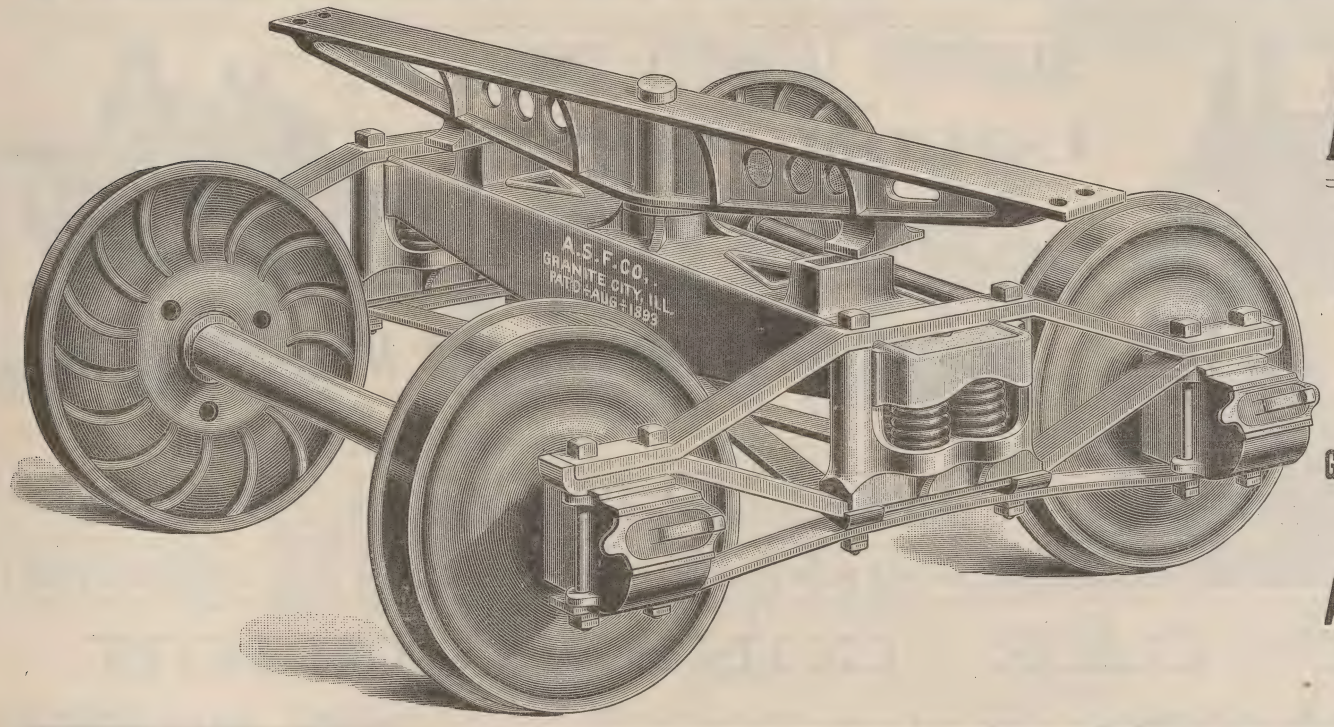

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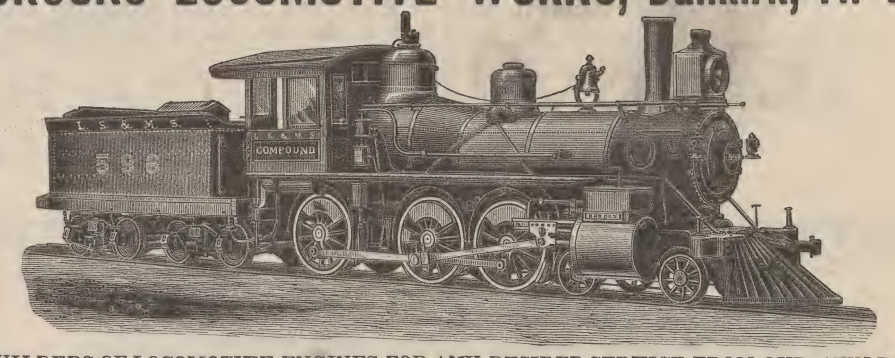

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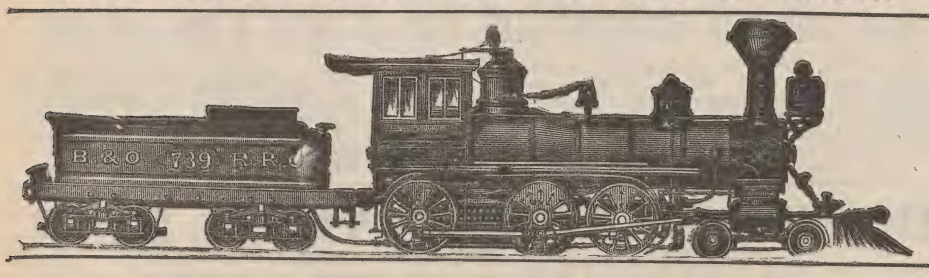

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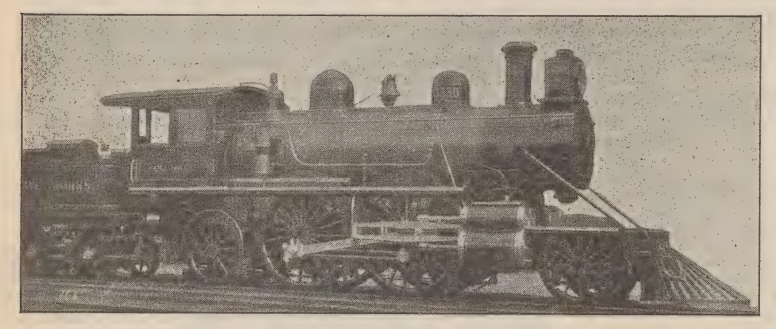

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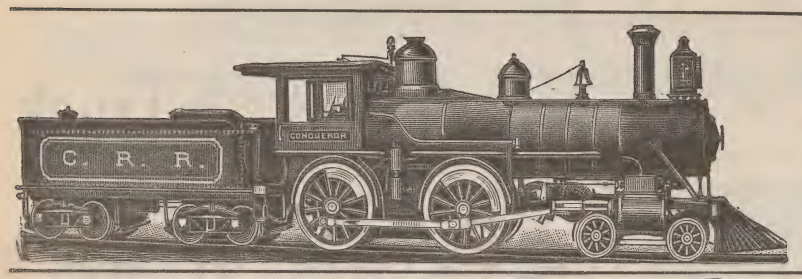

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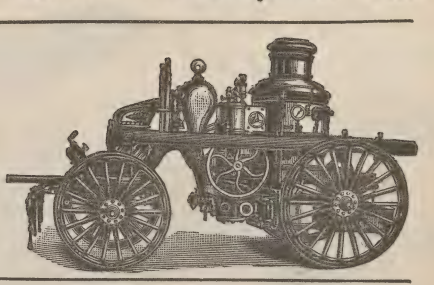

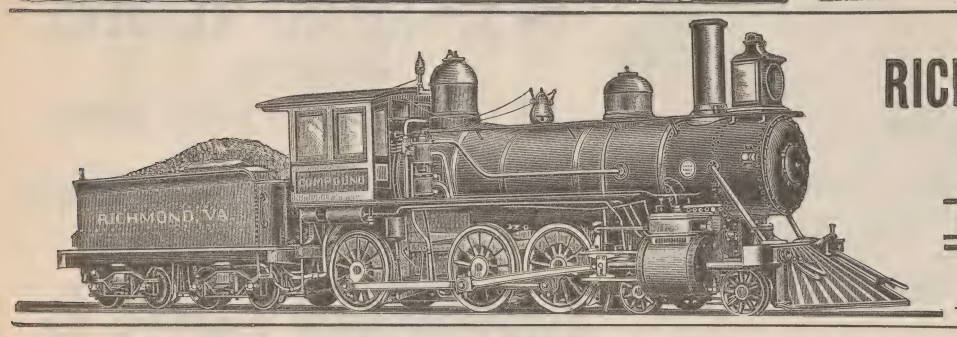

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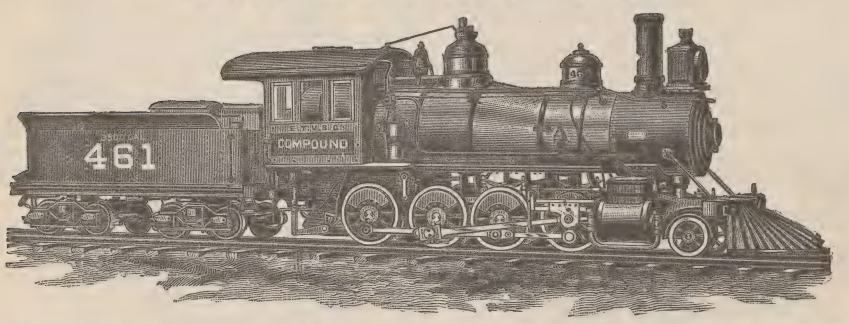

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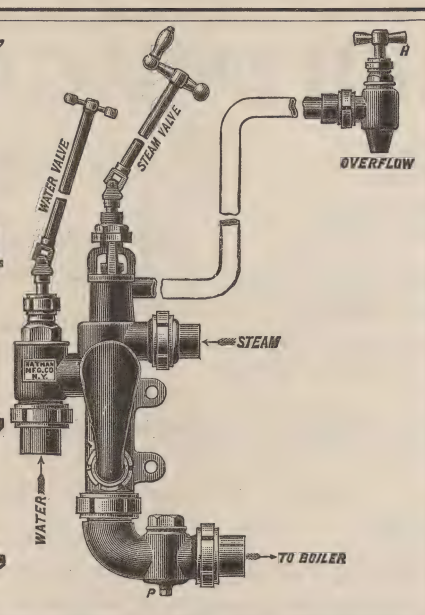

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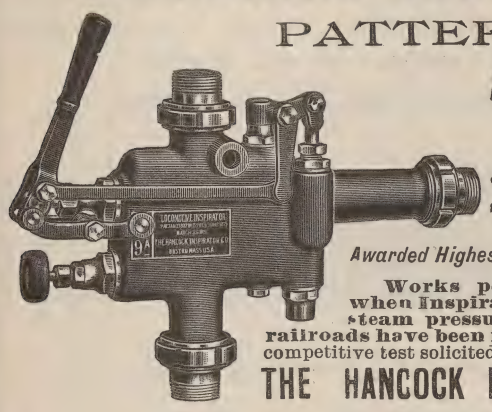

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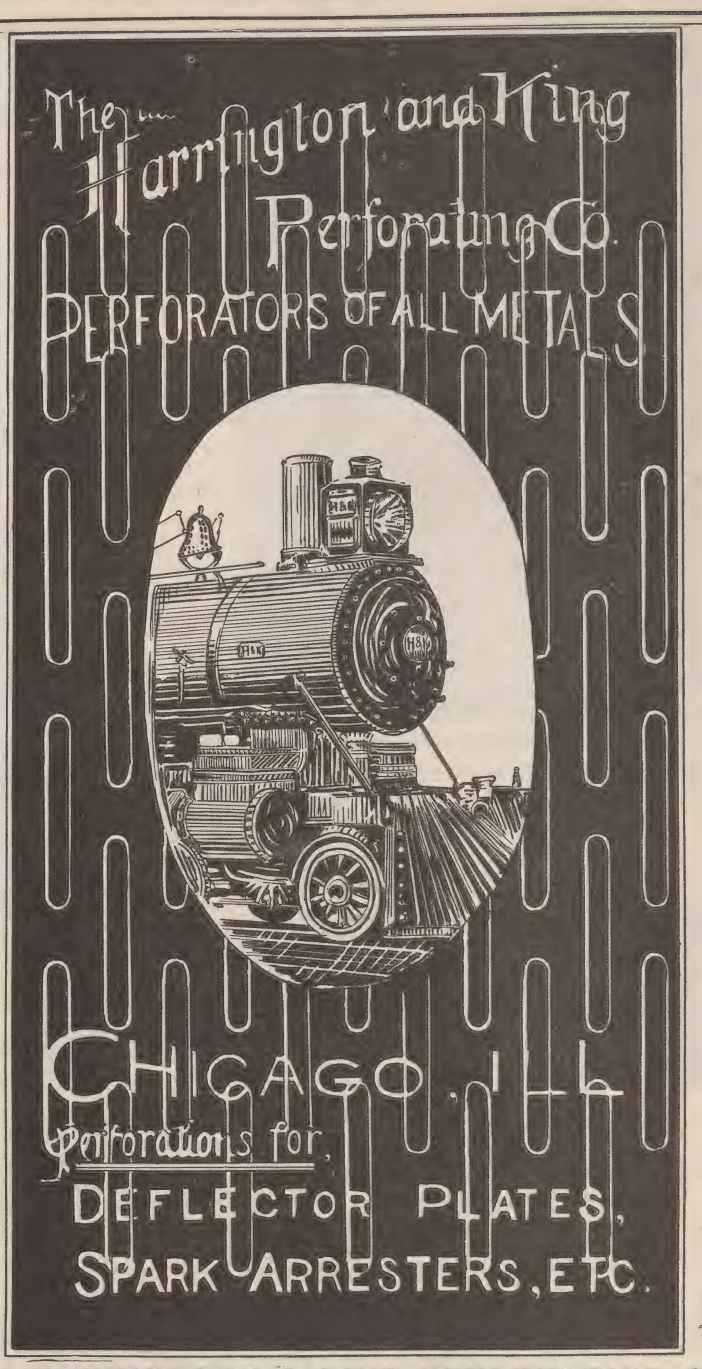

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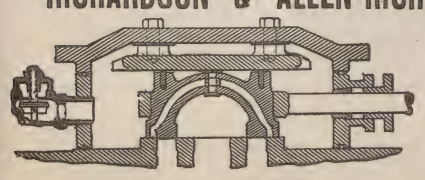

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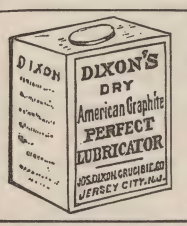

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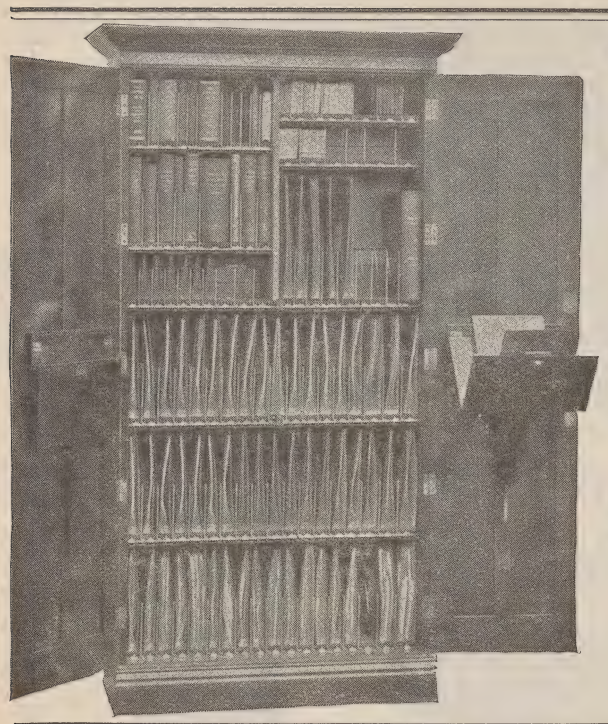

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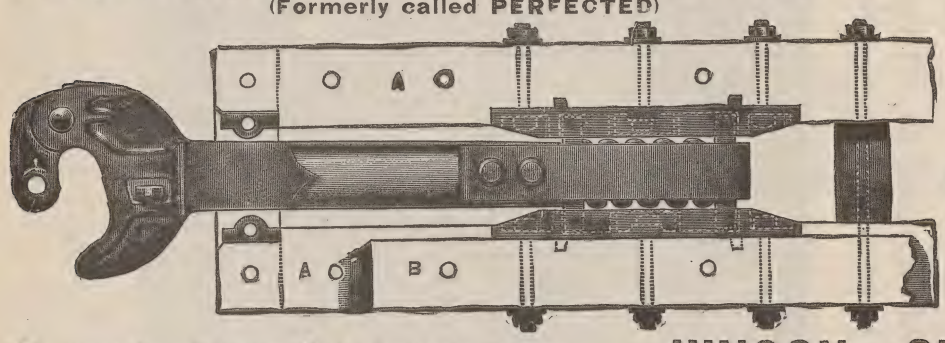

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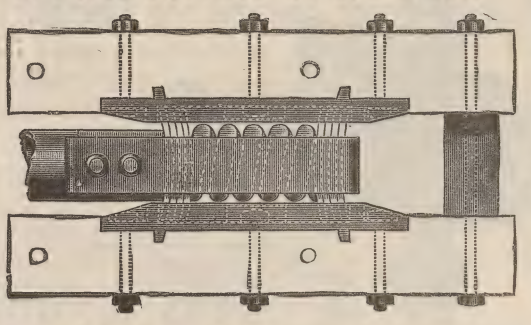

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T. Langstine, *M. M*.............Addison, N.Y.
Adirondack & St. Lawrence. (*See N. Y. Central.*)
Arizona & New Mexico Ry. 3 g. 71 m. 3 lo. 60 c.
James Colquhoun, *Pres*..........Clifton, Ariz.
J. G. Hopkins, *Sec. & Treas*......Clifton, Ariz.
Alabama Midland Ry. (*See Plant System.*)
Alberta Ry. & Coal Co. and Great Falls & Canada Ry. Co. 3 g. 67 m. 18 lo. 250 cars.
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W. D. Barclay, *Man. & Pur. Agt.*, Lethbridge, Alberta,
T. McNabb, *M. M. & M. C. B.* Lethbridge, Alberta.
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Albemarle & Raleigh R.R. (*See Atlantic Coast Line*)
Allegheny & Kinzua R. R. 4-8½ g. 42 m. 2 lo. 45 c.
A. D. Scott, *Receiver* ....Buffalo, N. Y.
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D. McCargo, *Gen. Supt*.......Pittsburgh, Pa.
H. D. Mason, *Pur. Agt*.........Pittsburgh, Pa.
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John Cowan, *M. C. B*..............Verona, Pa.
Alliance & Northern. 4-8½ g. 25. m. 2 lo. 38 cars.
E. E. Scranton, *G. M. & P. A*..... Alliance, O.
C. P. Finch, *M. C. B*.............Alliance, O.
Annapolis, Wash & Balt. R. R. 4-8½ g. 20½ m. 3 lo. 9 c.
John W. Brown, *Gen. Man. & Pur. Agt.*, Baltimore, Md.
John L. Beall, *M. M*...........Annapolis, Md.
Ann Arbor R. R.
4 ft.—8½g., 300 m., 44 l., 1,500 cars.
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F. S. Chandler, *Pur. Agt*.........Toledo, O.
Arkansas Midland R. R. 4-8½ g. 74 m. 7 lo. 126 cars.
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J. B. Johnson, *Supt. & Pur. Agt*..Helena, Ark.
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John A. Greenhoe, *M. C. B*......Helena, Ark.
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W. H. Apple, *M. M*............ Ashland, Ky.
Robt. Peebles, *Pur. Agt*.........Ashland, Ky.
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C. M. Taylor, *M. M*.......San Marcial, N. M.
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4-8½ g. 81 m. 5 lo. 65 cars.
C. N. Armstrong, *Gen. Man*...Montreal, Que.
A. C. Wortele, *Pur. Agt*.......Montreal, Que.
Jos. Hunter, *M. M & M.C.B.* Metapedia, Que.
Atlantic & No. Carolina R.R. 4-9 g. 95 m. 7 l. 107 c.
S. L. Dill, *Supt*.................Newbern, N. C.
F. C. Roberts, *Pur. Agt*.......Newbern, N. C.
W. R. Waters, *M. M*...........Newbern, N. C.
J. B. Taylor, *M. C B*..........Newbern, N. C.
Atlantic & Western R. R.
(*See J., St. A. & I. River Ry. Co.*)
Atlanta & West Point and Western Ry. of Alabama.
4-9 g. 225 m. 33 lo. 608 cars.
Geo. C. Smith, *Pres. & Gen. Man.* Atlanta, Ga.
Joseph Herrin, *Supt*.......Montgomery, Ala.
J. C. McCarty, *M. M*.......Montgomery, Ala.
Atlantic, Tenn.& Ohio R.R....... (*See Rich. & Dan.*
Augusta Southern. 3 ft. g. 84 m. 4 lo. 26 cars.
W. B. Thomas, *Gen. Man*........Augusta, Ga.
F. W. Reaney, *M. M. & M. C. B.* Augusta, Ga.
Au Sable & Northwestern. 3 g. 110 m. 16 l. 325 c
G. A. Loud, *Gen. Man*... Au Sable, Mich.
W. F. Loud, *Pur. Agt*.........Au Sable, Mich.
A. E. Walker, *M. M*.........McKinley, Mich.
John Law, Jr., *M. C. B*......McKinley, Mich.
Austin & North Western R.R. 4-8½ g. 106 m. 8 l. 308c.
A. N. Leitnaker, *V. P. & G. Supt.* Austin, Tex.
Geo. Howes, *Pur. Agt*...... New York, N. Y.
Jas. McGee, *Supt. M. P. & M*..Houston, Tex.
C. H. Burns, *M. M*..............Houston, Tex.

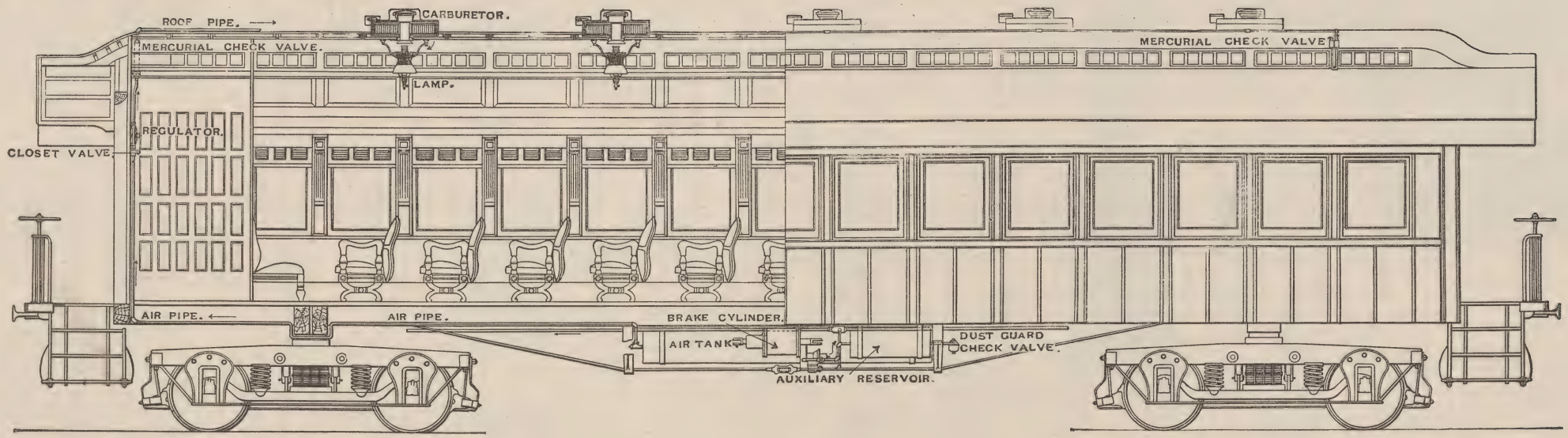
B

Baltimore, Chesapeake & Atlantic R.R.
4-8½ g. 88 m. 8 lo 98 c.
W. Thomson, *Gen. M. & P. A.* Baltimore, Md.
Fred Strattner, *M.M.&M.C.B.*.Salisbury, Md.
Baltimore & Annapolis Short Line R. R.
26 m. 6 lo. 16 pass. 40 frt. c.
C. A. Coombs, *Gen. Man*.......Baltimore, Md.
J. P. Seward, *M. M*.............Annapolis, Md.
Baltimore & Delaware Bay R. R. Co.
4-8½ g. 49 m. 3 lo. 7 cars.
E. P. Stacey, *G. S. & Pur. A*...Clayton, Del.
Baltimore & Potomac R.R.........(*See Penna. R.R.*)
Baltimore & Lehigh R. R. Co.
3 ft. g. 42.9 m. 10 lo. 221 cars.
W. A. Moore, *G. M. & Pur. A.* Baltimore, Md.
F. H. McGee, *M. M*........... Baltimore, Md.
Baltimore & Ohio R. R.
4-8½ g. 2,680 m. 870 lo. 29,097 cars.
R. B. Campbell, *Gen. Man*.....Baltimore, Md.
G. B. Hazlehurst, *G. Supt. M. P.* Baltimore, Md.
L. J. Buckley, *Pur. Agt*........Baltimore, Md.
A. J. Cromwell, *Supt. M. P.*, Lines East of Ohio River, Baltimore, Md.
E. W. Grieves, *Supt. Car Dept* Baltimore, Md.
Main Stem Div.:
E. T. White, *Div. M. M.*, Riverside, Baltimore, Md.
S. B. Crawford, *M. M*...........Baltimore, Md.
J. M. Marsteller, *M. M*....Martinsburg, W.Va.
P. Hayden, *M. M*............Piedmont, W. Va.
S. A. Souther, *Div. M. M*..... Grafton, W. Va.
Pittsg. Div.:
M. B. Cutter, *Supt*............ Pittsburgh, Pa.
I. N. Kalbaugh, *Div. M. M* ....Glenwood, Pa.
Phil. Div.:
J. R. C. Wrenshall, *Supt*....Philadelphia, Pa.
Thos. Tresize, *Div. M. M*....Philadelphia, Pa.
Trans-Ohio Div.:
W. H. Harrison, *Supt. M. P*.......Newark, O.
Ohio Divs.:
J. M. Graham, *Supt*............... Newark, O.
E. L. Weisgerber, *Div. M. M*......Newark, O.
Akron & Wooster Branch Div.:
J. T. Johnson, *Supt*..................Akron, O
T. Taylor, *M. M*.... ...Chicago Junction, O
Chicago Div.:
P. C. Sneed, *Supt*..................Garrett, Ind.
J. Billingham, *Div. M.M*.... .Garrett, Ind.
Baltimore, & Ohio Southwestern R. R. Co.
4-8½g. 928 m. 194 lo. 7,474 c.
I. G. Rawn, *Gen. Supt*..........Cincinnati, O.
W. W. Peabody, *G. Man. & P. A.* Cincinnati, O.
J. G. Neuffer, *M. M. & M.C.B*..Cincinnati, O.
Bangor & Aroostook R. R. 4-8½ g. 263 m. 32 lo. 375 c.
F. W. Cram, *Gen. Man. & P. A*..Bangor, Me.
Orlando Stewart, *Supt. M. P. & M.*, Oldtown, Me.
J. W. Comins, *M. C. B*.... Oldtown, Me
Bangor & Portland Ry. 4-8½ g. 50 m. 7 lo. 59 c
C. Miller, *G. Man. & P. A*..........Bangor, Pa.
G. Holmes, *M. M*.................. Bangor, Pa.
Barre R. R. Co. 4-8½ g. 26 m. 4 lo. 41 cars
F. W. Stanyan, *G. S. & Pur. A*....Barre, Vt.
G. Jacobson, *M. M*...................Barre, Vt.
Chas. Robinson, *M. C. B*......Montpelier, Vt.
Barclay R. R. 4-8½ g. 15 m. 5 lo. 25 c.
E. O. Macfarlane, *Supt*......... Towanda, Pa.
Bath & Hammondsport R. R. 4-8½g. 10 m. 2 lo. 9 c.
H.S. Stebbins, *Man.& P.A.* Hammondsport, N.Y.
C. G. Griswold, *M. C. B.* Hammondsport, N.Y.
Bay of Quinte Ry. & Navigation Co.
4-8½ g. 85 m. 5 lo. 133 cars.
R. C. Carter, *Gen. Man*....... Deseronto, Ont.
F. S. Rathbun, *Pur. Agt* .....Deseronto, Ont.
Wm Evans, *M. C. B* ....Deseronto, Ont.
Beech Creek R. R. 4-8½ g. 185 m. 47 l. 3,887 c, N. Y. C. & H. R., Lessee.
J. D. Layng, *Gen. Man*...New York City, N. Y.
A. G. Palmer, *Supt. & P. A* .Jersey Shore, Pa.
La Mott Ames, *M. M* ... .Jersey Shore, Pa
A. L. Dravenstadt, *M. C. B*...Jersey Shore, Pa
Bellaire, Zanesville & Cin. Ry. Co. 3g. 111 m. 7 lo. 179c
J. K. Geddes, *Rec. & Gen. Man*..Zanesvile, O.
J. A. Cox, *Pur. Agt*............ Zanesville, O.
V. B. Stubbins, *M. M*............Zanesville, O.
Bellefonte Central. 4-9 g. 28 m 3 lo. 70 cars.
F. H. Thomas, *Supt*............Bellefonte, Pa.
Robt. Frazer, *Pres & P. A.* Philadelphia, Pa.
W. Bartlett, *M. C. B*.... .....Bellefonte, Pa.
Bellingham Bay & British Columbia Ry.
4-8½ g. 25.52 m. 4 lo. 58 cars.
C. L. Anderson, *Gen. Man., Supt. & Pur. A.* New Whatcom, Wash.
R. E. Nevins, *M. M. & M. C. B.*, New Whatcom, Wash.
Bennington & Rutland Ry. 4-8½ g. 54 m. 12 lo. 327 c.
E. D. Bennett, *Supt.&Pur.Agt.* Bennington, Vt.
Chas. J. McMaster, *M. M. & C. B*..Rutland, Vt.
Birmingham & Atlantic Ry. 4-8½ g. 35 m. 4 lo. 50 c.
G. A. Mathison, *Gen. Supt. & Pur. A.*, Talladega, Ala.
J.J. Thomas, Jr., *M. M.&M.C.B.* Talladega, Ala
Birmingham, Sheffield & Tenn. River Ry.
4-9 g. 120 m. 11 lo. 563 cars.
Philip Campbell, *G. M & Pur. A.* Sheffield, Ala
Black Hills & Fort Pierre. 3 g. 36.4 m. 5 lo. 125 c
T. J. Grier, *Gen. Man*...... Lead City, S. D.
John A. Spargo, *M. M*......Lead City, S. D.
Bloomsburg & Sullivan. 4-9 g. 35 m. 5 lo. 25 cars.
F. M. Leader, *Gen. Man* ....Bloomsburg, Pa.
Boston & Albany R.R.
4-8½ g. 388 m. 240 lo. 7,242 c.
W. H. Barnes, *Gen. Man*.. ......Boston, Mass.
Wm. H. Taft, *Act. Supt. M.P.*, Springfield, Mass.
F. D. Adams, *Gen. M. C. B*.......Allston, Mass.
J. P. Condon, *For. C. Shop*.....Allston, Mass.
C. H. Barnes, *Div. M. M*........Boston, Mass.
Thos. B. Purvis, *Div. M. M.* Springfield, Mass.
J. E. Doran, *For. Car Sh*...East Albany, N.Y.
E. Priest, *Div. M M*.......East Albany, N.Y.
Boston & Lowell R. R. (*Leased to Boston & Maine*)
Boston & Maine R. R. 4-8½g. 1,727.22m. 671 lo. 14,067.
Lucius Tuttle, *Pres*.............. Boston, Mass.
T. A. Mackinnon, *Gen. Man*......Boston, Mass.
J. A. Farrington, *Pur. Agt*.......Boston, Mass.
Henry Bartlett, *Supt. M. P*......Boston, Mass.
J. T. Chamberlain, *M. C. B*..... Boston, Mass.
West'n Div.: Wm. Merritt, *Supt.* Boston, Mass.
A. B. Barrett, *Div. M. M*.......Boston, Mass.
Eastern Div.:
W. T. Perkins, *Supt*..........Boston, Mass.
A. B. Barrett, *Div. M. M*......Boston, Mass.
Northern Div.:
J. W. Sanborn, *Supt*.... Sanbornville, N. H.
Southern Div.:
G. F. Evans, *Supt* ....Boston, Mass.
E. T. Summer, *Div. M. M.* East Cambridge, Mass
Worc., Nashua & Port. Div.:
Frank Barr, *Supt*...... ....Nashua, N. H.
C. L. Aiken, *Div. M. M*....Worcester, Mass.
Connecticut & Passumpaic Div.:
H. E. Folsom, *Supt*.... .....Lyndonville, Vt.
L. C. Todd, *Div. M. M* ....Lyndonville, Vt.
Geo. A. Ferguson, *Div. M. M.* Springfield, Mass.
Concord Div.:
H. E. Chamberlin, *Supt* .....Concord, N. H.
C. H. Wiggin, *Div. M. M*.... Concord, N. H.
White Mountain Div.:
G. E. Cummings, *Supt*....Woodsville, N. H.
C. H. Wiggin, *M. M*...... ....Concord, N. H.
Boston & Providence R.R......(*See Old Colony R. R.*)
Boston, Revere Beach & Lynn R.R. 3 g. 14 m. 12 lo. 53c.
J. A. Fenno *Supt & P. Agt*.....Boston, Mass.
R. D. Sutherland, *M. M*...... ...Boston, Mass.
John Coghlan, *M. C. B*...... ....Boston, Mass.
Bradford, Bordell & Kinzua R. R. 3 g. 32m. 6 lo. 141c.
J. C. McKenna, *Gen. Man. & P. A.* Bradford, Pa.
Chas. Greenough, *M. M. & M. C. B.*, Bradford, Pa.
Brainerd & Northern Minnesota R. R.
4-8½ g. 70 m. 72 lo. 750 cars.
B. F. Nelson, *Gen. Man*..Minneapolis, Minn.
Walter H. Brimson, *Supt*.. .Brainerd, Minn.
W. F. Brooks, *Pur. Agt*..Minneapolis, Minn.
J. N. Sanborn, *M.M.&M.C.B.* Brainerd, Minn.
Brooklyn & Brighton Beach R. R.
4-8½ g. 15 m. 8 lo. 44 c. 8 frt. c.
Wm. Finley, *Supt. & Pur. Agt.* Brooklyn, N. Y.
John Finley, *M. M*...........Brooklyn, N. Y.
H. Watts, *Fore. Car Rep*...Brooklyn, N. Y.
Brooklyn Elevated R.R. 4-8½ g. 20 m. 95 lo. 290 c.
J. D. Barton, *Gen. Supt*........Brooklyn, N.Y.
E. P. Mallinson, *M. M*.........Brooklyn, N.Y.
Brunswick & Western R. R. (*See Plant System.*)
Buffalo, Attica & Arcade R. R. Co.
4-8½ g. 26 m. 1 lo. 1 c.
S. S. Bullis, *Gen. Man*..........Olean, N. Y.
G. W. Conklin, *G.S., P.A., M. M. & M. C. B.*, Attica, N. Y.
Buffalo, Rochester & Pittsburg Ry.
4-8½g. 355 m. 135 lo. 6,992 c.
G. E. Merchant, *Asst to Pres. & Pur. Agt.* Rochester, N. Y.
R. G. Mathews, *Gen. Supt*......Rochester, N.Y.
C. E. Turner, *Supt. M. P*.....Rochester, N. Y.
F. J. Lauer, *M. C. B*..... ...Rochester, N. Y.
Rochester & Buffalo Div.
J. A. Barhydt, *M. M*........Rochester, N. Y.
Pittsburg Div.
A. Bardsley, *M. M*.............Bradford, Pa.
Buffalo & Susquehanna Ry.
4-8½ g. 112 m. 25 lo. 1,150 cars.
G. W. Goodyear, *Gen. Man*...Buffalo, N. Y.
E. O. Cheney, *Pur. Agt*.... .....Austin, Pa.
John D. Campbell, *M. M & M.C.B.* Austin, Pa.
Burlington & Mo. Riv. R. R. (in Neb.) (*See C., B. & Q.*).
Burlington & North-West'n and Bur.& West'n Rys.
4-8½ g. 123 m. 7 lo. 397 c.
Robt. Law, *Man. & P. A*.......Burlington, Ia.
Adam Metz, *M. M*..............Burlington, Ia
Burlington, Cedar Rapids & Northern Ry.
4-8½ g. 1,145 m. 128 lo. 4,900 cars.
C. J. Ives, *Pres*.............Cedar Rapids, Ia.
Robt. Williams, *Gen. Supt*....Cedar Rapids, Ia.
W. J. Morrison, *Pur. Agt*. .Cedar Rapids, Ia.
R. W. Bushnell, *M. M*.......Cedar Rapids, Ia.
G. L. Dickover, *G.F. Car Sh.* Cedar Rapids, Ia.
Butte, Anaconda & Pac. Ry. 4-8½g. 42m. 13 l. 350c.
M. Donahoe, *Gen. Man.& P. A.* Anaconda, Mont.
A. Harrity, *M.M.&M. C.B.* Anaconda, Mont.

C

Calumet & Blue Island Ry 4-8½g. 269m. 55 l. 3,100c.
W. G. Brimson, *Pres. & G. M*..Chicago, Ill.
L. D. Doty, *Pur. Agt*.......... Chicago, Ill.
C. J. Clifford, *M. M*..........So. Chicago, Ill.
E. B. Smith, *M. C. B*.......So. Chicago, Ill.
Camden & Atlantic R. R. ....(*See Penna. R.R.*)
Canada Atlantic Ry. 4-8½ g. 134.8 m. 25 l. 2,263c.
E. J. Chamberlin, *G. M.& P. A*...Ottawa, Ont.
M. Donaldson, *S.&M.M.&M.C.B.*, Ottawa, Ont.
Canadian Pacific Ry.
4-8½ g. 7, 178 m. 615 lo. 675 pass. 15,769 frt. c.
W. C. Van Horne, *Pres* ......Montreal, Can.
R. Atkinson, *Act. Mech. Supt.* Montreal, Can.
G. H. Eaton, *Act. M. C. B* ....Montreal, Can.
A. C. Henry, *Pur. Agt*..... ....Montreal, Can.
Atlantic Div.:
H. P. Timmerman, *Gen. Supt.* St. John, N.B. ....McAdam, N. B
Div.: C. W. Spencer, *Gen. Supt.* Montreal, Can
J. Elliott, *M. M*...................Carleton, Ont.
W. Div.: Wm. Whyte, *Gen. Supt.* Winnipeg, Man.
W. Cross, *M. M*.... ....Winnipeg, Man
O. & Q. Div.:
J. W. Leonard, *Gen. Supt*.....Toronto, Ont.
George McKinnon, *M. M*.......Toronto, Ont.
G. S. Mackinnon, *M. M*........Farnham, Que.
Pac. Div.: H. Abbott, *Gen. Supt.* Vancouver, B.C.
L. R. Johnson, *M. M*.......Vancouver, B. C.
Cape F'r & Yadkin V.R.R. 4-9 g. 340 m. 28 lo. 611 c.
John Gill, *Rec*...............Baltimore, Md.
J. W. Fry, *Gen. Man.& P. A*..Greensboro, N. C.
I. W. Clark, *M. M*..........Fayetteville, N. C.
Carolina Central. 4 g. 267 m. 24 l. 354 c.
J. C. Winder, *Gen. Man* ......Portsmouth, Va.
L. T. Myers, *Gen. Supt. & P. A.* Portsmouth, Va.
Carolina Midland R. R 4-8½ g. 55 m. 4 lo. 30 cars.
J. C. Keys, *G. S., P. A.& M. M.* Blackville, S.C.
Carrabelle, Tallahassee & Georgia R. R.
4-8½ g. 50 m. 3 l. 60 cars.
S. D. Chittenden, *Gen. Man.* Tallahassee, Fla.
S. A. Sheppard, *M. M*.. .... Tallahassee, Fla.
Carson & Colorado. 3 g. 299 m. 8 lo. 227 cars.
H. M. Yerington, *P. & G. S.* Carson City, Nev.
Hume Yerington, *Pur. Agt*..Carson City, Nev.
W. L. Wolley, *M. M*..........Hawthorne, Nev.
C. A. Brulin, *M. C. B*........Carson City, Nev.
Carthage & Adirondack Ry.
(*See N. Y. C. & H. R. R. Co.*
Central Branch Union Pac. (*See Mo. Pac.*; (3) *Div.*)
Centralia & Chester R. R. 4-8½g. 67m. 5 l. 21c.
R. H. Rosborough, *Gen. Man* ....Sparta, Ill.
G. W. Bartlett, *Asst. G. M. & Pur. Agt.*, Sparta, Ill.
P. W. Croak, *M. M*...... ....Sparta, Ill.
Central New York & Western R. R.
4-8½ & 3 g, 46 m. stand. & 18m. narrow g. 11 lo. 91c.
M. S. Blair, *Gen. Supt*.... Hornellsville, N. Y.
L. B. Heers, *M. M.* ....Angelica, N. Y.
Central Ontario Ry. 4-8½ g. 104 m. 8 lo. 125 c.
Geo. Collins, *Gen. Supt. & P.A* .Trenton, Ont.
D. Duff, *M. M.& M.C. B*.........Trenton, Ont.
Central Pac. R. R. (*See Southern Pacific Co.*
Central Penn. & Western R R. 4-9 g. 31 m. 2 lo. 9c.
S. B. Haupt, *G. M. & P. A* Watsontown, Pa.
Central R. R. & Banking Co. of Georgia.
4-8½ g. 1,417 m. 209 lo. 5,345 cars.
H. M. Comer, }
R. Somers Hayes, } *Receivers*..Savannah, Ga.
T. D. Kline, *Gen. Supt*... ....Savannah, Ga
J. W. Comer, *Pur. Agt* ....Savannah, Ga.
T. B. Irvin, *M. M* ... .Savannah, Ga.
So.-West'n Div.: B.C. Epperson, *Supt.* Macon, Ga.
John Dempsey, *M. M*...............Macon, Ga.
J. L. Whitsitt, *M. M*.......... .. Columbus, Ga.
S. A. Charpiot, *M. C. B*..... ....Macon, Ga.
W. H. Stubb, *M. M*.............Augusta, Ga.
Central R.R. of New Jersey.
Operating Cumb. & Maurice River and Lehigh & Lackawanna roads. 4-8½ g. 628 m. 442 l. 29,780 c.
J. H. Olhausen, *Gen. Supt*..Jersey City, N. J
G. D. W. Smith, *Pur. Agt*.. Jersey City, N. J.
C. A. Thompson, *Supt. M. P.* Jersey City, N. J
N. J. Cent. Div.:
W. H. Peddle, *Supt* ....Jersey City, N.J
W. L. Hoffecker, *M. M*..Elizabethport, N. J
N. J. South. Div.:
W. V. Clark, *Supt*...... ....Long Branch, N. J
W. Montgomery, *M. M*.... .. Manchester, N.J.
L. & S. Div.:
G. W. Twining, *Supt*......, Mauch Chunk, Pa.
J. G. Thomas, *Asst. Supt. M.B.& E.* Ashley, Pa.
Central R. R. of S. C. (*See Atlantic Coast Line.*)
Central Texas & N'w'n R. R. (*See Hous. & Tex. Cen.*
Central Vermont R. R. 4-8½ g. 796 m. 200 lo. 4,314 c
F. W. Baldwin, *Gen. Supt*... . St. Albans, Vt.
W. B. Hatch, *Pur. Agt* ....St. Albans, Vt.
C. E. Fuller, Jr., *Supt. M. P*...St. Albans, Vt.
W. J. Robertson, *M. C. B*.. ....St. Albans, Vt.
Rut. Div.: J. Burdett, *Supt*.........Rutland, Vt.
G. W. Kinney, *M. M*....... ......Rutland, Vt.
New London No'n R. R. 121 m. 24 lo. 382 c
D. Mackenzie, *Supt*.... ....N. London, Ct.
J. Hinchy, *M. M*...... ...... New London, Ct.
L. Beckwith, *M. C. B* ....New London, Ct.
Og. & L. Cham. Div.: 4 8½g. 118m. 28 l. 1,583 c.
Frank Owen, *Supt*..........Ogdensburg, N. Y.
Thos. Rumney, *Div. M. M*......Malone, N. Y.
Charleston & Savannah. (*See Plant System.*)
Charleston, Sumt. & No. R.R. 4-9g. 150m. 11 lo. 306c
C. Millard, *Supt. & Pur. Agt*...Sumter, S. C.
E. M. Raynor, *M. M*.............Sumter, S. C.
Charlotte, Columbia & Augusta R.R. (*See S. Ry. Co.*)
Chattanooga Southern Ry. 4-8½g. 95 m. 6 lo. 228 c.
J. W. Burke, *Rec.& Man.* Chattanooga, Tenn.
H. T. Ellison, *M. M*........Chattanooga, Tenn.
H. P. Eager, *Pur. Agt*....... ....Chatt, Tenn.
Chat., Rome & Colum. Ry. 4-9 g. 138 m. 9 lo. 79 c.
E. E. Jones, *Rec. & Pur. Agt*......Rome, Ga.
W. A. Love, *M. M. & M. C. B*......Rome, Ga
Chateaugay R. R. 3 g. 73 m. 11 lo. 518 cars.
J. N. Stower, *G. M. & Pur. A.* Plattsburg, N.Y.
A. W. Fee, *M.M.&M.C.B.* Lyon Mountain, N.Y.
Chesapeake & Nashville
4-9 g. 35 m. 3 lo. 45 ft. 2 pass. cars.
Gen. John Echols, *Gen. Man.* .Louisville, Ky.
Chesapeake & Ohio Ry. 4-9 g. 1,360 m. 359 l. 14,111 c.
Geo. W. Stevens, *Gen. Man*....Richmond, Va.
W. F. La Bonta, *Pur. Agt* ....Richmond, Va.
W. S. Morris, *Supt. M. P*......Richmond, Va.
T. S. Lloyd, *M. M*..................Richmond, Va.
A. F. Stewart, *M. M*.....Huntington, W. Va.
Chesapeake, Ohio & Southwestern Ry. Co. and Ohio Valley Ry. Co.
John Echols, *Gen. Man*........ Louisville, Ky.
F. D. Thompson, *Gen. Supt*....Louisville, Ky.
Geo. Dickey, *Gen. M. M*..... Paducah, Ky.
Wm. P. McDowell, *Pur. Agt*..Louisville, Ky.
Chester & Lenoir Ry. 3 g. 110 m. 6 lo. 95 cars.
L. T. Nichols, *Supt.& P.A* .....Chester, S.C.
W. A. Davis, *For. Shops*.......Chester, S. C.
S. D. Scarborough, *Car For*...Chester, S. C.
Chicago & Alton R.R. 4-8½ g. 850 m. 240 lo. 7,800c.
C. H. Chappell, *Gen Man*.........Chicago, Ill.
A. V. Hartwell, *Pur. Agt*..........Chicago, Ill.
J. Johann, *S. Mch* .... Bloomington, Ill.
J. Townsend, *M.C.B*........ Bloomington, Ill.
Chicago & Calumet Terminal Ry. Co.
(*See Chicago & Northern Pacific R. R.*)
Chicago & Erie R.R. (*See N. Y., L. E. & W. Ry.*)
Chicago & Eastern Illinois R. R.
4-8½ g. 502 m. 138 lo. 8,780 c.
E. P. Broughton, *Gen. Supt*......Chicago, Ill.
G. J. Schappert, *Pur. Agt* ....Chicago, Ill.
Allen Cook, *S. M. P. & M* .... Danville, Ill.
Chicago, Ft. Madison & Des Moines R. R.
4-8½ g. 71 m. 3 lo. 28 c.
E. F. Potter, *Gen. Man.&P.A.* Ft. Madison, Ia.
Chicago & Gr. Trunk and Det., Gr. Haven & Mil. Ry; Cincinnati, Saginaw & Mackinaw R. R.; Toledo, Saginaw & Muskegon R. R.
4-8½ g. 763 m. 206 lo. 3,883 cars.
W. J. Spicer, *Gen. Man*... ... Detroit, Mich.
J. S. Lorimer, *Gen. Store Keeper*. Detroit, Mich.
H. Roberts, *Mech. Supt*.........Detroit, Mich.
Chicago & Iowa R.R. (*See C., B. & Q.*
Chicago & Northern Pacific R. R.
(*Operated by Wisconsin Central Co.*)
4-8½ g. 123.65m. 241. 116 cars.
A. L. Hopkins, *Rec* ....Chicago, Ill.
S. R. Ainslie, *Gen. Man*.........Chicago, Ill.
W. B. Mallette, *Pur. Agt* ....Chicago, Ill.
J. McNaughton, *Supt. M.P.* Waukesha, Wis.
Chicago & Northwestern Ry.
4-8½ g. 5,006.13 m. 1,018 lo. 35,613 cars.
John M. Whitman, *Gen. Man*......Chicago, Ill
Chas. Hayward, *Pur. Agt*..........Chicago, Ill.
Robt. Quayle, *Supt. M. P. & M*...Chicago, Ill.
C. A. Schroyer, *S. C. D*............Chicago, Ill.
Wis. Div.: W. A. Gardner, *Supt*.... Chicago, Ill.
J. Heath, *M. M*....... ....Chicago, Ill.
Gal. Div.: J. C. Stuart, *Supt*.........Chicago, Ill.
R. Erkshine, *M. M*.................Chicago, Ill.
Penn. Div.: W.B. Linsley, *Supt.* Escanaba, Mich.
J. W. Clark, *M. M*...... .....Escanaba, Mich.
Mad. Div.: R. A. Cowan, *Supt*.... Baraboo, Wis.
H. D. Page, *M. M*............... Baraboo, Wis.
W. & St. P. Div.:
W. P. Cosgrove, *Supt*... ....Winona, Minn,
Wm. McIntosh, *M. M*..........Winona, Minn
Ia. Div.: P. Hallonbeck, *Supt*.........Boone, Ia.
J. Cockfield, *M. M*...................Clinton, Ia.
No. Iowa Div.: H. M Hughes, *S*..Eagle Grove, Ia.
Wm. Hutchinson *Foreman*...Eagle Grove, Ia
Ashland Div.:
G. F. Bidwell, *Supt*............Kaukauna, Wis.
M. M..........Kaukauna, Wis
Chicago, Peoria & St. Louis Ry.
4-8½ g. 225 m. 38 lo. 1,867 cars.
C. H. Bosworth, *G. M. & Rec.* Springfield, Ill.
F. C. Dodds, *Pur. Agt*.........Springfield, Ill.
W.J. Hemphill, *M.M.&M.C.B.* Jacksonville, Ill.
Chicago & West. Michigan.
4-8½ g. 574 m. 76 lo. 2,944 cars.
Chas. M. Heald, *G M*.... Grand Rapids, Mich.
Russell Wallace, *Pur. Agt.* Grand Rapids, Mich.
B. Haskell, *S. M. P* ....Grand Rapids, Mich
W. K. Christie, *M. M* ....Muskegon, Mich
Chicago, Bur. & Kan. City Ry. (*See C., B. & Q.*
Chicago, Burlington & Northern
4-8½ g. 371 m. 50 lo. 3,420 c.
J. R. Hastings, *Gen. Supt* ....St. Paul, Minn.
Geo. Hargreaves, *Pur. Agt*........Chicago, Ill.
W. H. Lewis, *M. M*..........La Crosse, Wis.
Chicago, Burlington & Quincy R. R.
4-8½ g. 2,217 m. 546 lo. 22,469 cars.
W. F. Merrill, *Gen. Man*.... ....Chicago, Ill
Geo. Hargreaves, *Pur. Agt*........Chicago, Ill.
G. G. Yeomans, *Asst. P. A*....... Chicago, Ill.
G. W. Rhodes, *Supt M. P*.........Aurora, Ill.
W. Forsyth, *Mech. Eng*........... Aurora, Ill.
R. D. Smith, *M. M*..................Chicago, Ill
Chi. Div.: H. D. Judson, *Supt*.... ....Aurora, Ill
A. Forsyth, *M. M*.. ....Aurora, Ill
Galesburg Div.:
W. B. Throop, *Supt*.........Galesburg, Ill.
R. W Colville, *M. M*.........Galesburg, Ill.
St. L. Div.: W. G. Besler, *Supt.* Beardstown, Ill.
C. W. Eckerson, *M. M* .....Beardstown, Ill.
Ia. & Mo. Lines.: C.M. Levey, *Supt.* Burlington, Ia
J. West, *M. M*..............W. Burlington, Ia.
East. Div.: O. E. Stewart, *Supt*.. Ottumwa, Ia.
J. F. Deems, *M. M*.............Ottumwa, Ia
Joel West, *M. M*... ... West Burlington, Ia.
West'n Div.: J.H. Duggan, *Supt*....Creston, Ia.
E. Jones, *M.M* . ...Creston, Ia.
Bur. & Mo. R. R. in Neb.:
4-8½ g. 3,510.7 m. 329 lo. 9,214 cars.
G. W. Holdrege, *Gen. Man*.......Omaha, Neb
D. Hawksworth, *Supt. M. P.* Plattsmouth, Neb.
E. S. Greusel, *M. M* ....Havelock, Neb.
R. T. Smith, *M. M*.... ....Lincoln, Neb.
A. B. Pirie, *M. M*. .. ..Wymore, Neb
R. B. Archibald, *M. M*....... .McCook, Neb.
J. P. Reardon, *M. M*. .... Alliance, Neb.
Chicago, Iowa & Dakota Ry. 4-8½ g. 27 m. 2 l. 17 c.
W. S. Porter, *Gen. Man.&Pur.A*....Eldora, Ia.
Chicago, Kalamazoo & Saginaw Ry.
4-8½ g. 45 m. 4 lo. 15 cars.
James H. Dewing, *V. P. & Gen. Man.*, Kalamazoo, Mich.
H. C. Potter, *V. P. & Gen. Man.*, Kalmazoo, Mich.
Chicago, Milwaukee & St. Paul Ry.
4-8½g. 6,154m. 852 lo. 28,965 cars.
A. J. Earling, *Gen. Man*.............Chicago, Ill.
J. T. Crocker, *Pur. Agt*............Chicago, Ill.
J. N. Barr, *Supt. M. P. & C. D.* Milwaukee, Wis.
A. E. Manchester, *A. S. M.P.* Milwaukee, Wis.
Geo. Gibbs, *Mech. Eng*. .. .... Milwaukee, Wis.
J. J. Hennessey, *M. C. B*...Milwaukee, Wis.
Chicago & Milw., Chicago & C. B. and Chicago Evanston Divs.:
J. B. Cable, *Supt*....... .. ..Chicago, Ill.
C. & C. B. Div. in Ia.: J. F. Gibson, *Supt.*, Marion, Ia.
Kansas City Div.:
E. D. Wright, *Supt*.... .... Kansas City, Mo.
La Crosse Div.:
D. C. Cheney, *Supt*............Milwaukee, Wis.
P. du Chien & Min. Point Div.:
W. W. Collins, *Supt*..... ... Milwaukee, Wis.
Northern Div.: J.M. Bunker, *Supt.* Milwaukee, Wis.
Dubuque Div.: J. W. Stapleton, *S*..Dubuque, Ia.
Geo. H. Brown, *M. M*.............Dubuque, Ia.
John Taylor, *M. M*.... ....Minneapolis, Minn.
Chicago, Paducah & Memphis R. R.
4-8½ g. 103 m. 4 lo. 71 cars.
B. F. Johnston, *Gen. Man*......St. Elmo, Ill.
Chicago, Rock Island & Pac. Ry.
4-8½ g. 3,574.1 m. 566 lo. 16,839 cars.
W. H. Truesdale, 3d *V. P.&G.M.* Chicago, Ill.
F. A. Marsh, *Pur. Agt*...............Chicago, Ill.
Geo. F. Wilson, *S. M. P*............Chicago, Ill.
Lines East of Missouri River:
Ill. Div.: C. L. Nichols, *Supt*.....Blue Island, Ill
J. W. Fitzgibbon, *M. M*...........Chicago, Ill.
A. Childs, *M. C. B*..................Chicago, Ill.
Ia. Divs.: H. Fox, *Supt*..........Des Moines, Ia.
A. L. Studer, *M. M*......... ......Stuart, Ia.
Des.M.Val.Div.: C.N. Gilmore, *Supt.* Des Moines, Ia.
J. B. Kilpatrick, *M. M*....Valley Junction, Ia.
So.-Wn. Div.: W. J. Lawrence, *Supt.* Trenton, Mo.
W. Gessler, *M. M*........ ......Trenton, Mo.
Lines West of Missouri River:
H. Monkhouse, *A. S., M. P.&E.* Horton, Kan

New Car Builder's Dictionary



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Chicago, St. Louis & Pittsburgh R.R. (*See Penn Co.*)
Chicago Great Western Ry.
4-8½ g. 928.26 m. 147 l. 5,028 c.
Samuel C. Stickney, *Gen. Man.* St. Paul, Minn.
J. Warwick, *Pur. Agt*........ ..St. Paul, Minn.
Tracy Lyon, *Supt. M. P.*.......St. Paul, Minn.
Chicago, St. Paul, Minneapolis & Omaha Ry.
4-8½ g. 1,492 m. 269 lo. 9,594 cars.
E. W. Winter, *Gen. Man* .....St. Paul, Minn.
W. H. S. Wright, *Pur. Agt*......St. Paul, Minn.
J. J. Ellis, *M. M.*.. . ...St. Paul, Minn
H. L. Preston, *M. C. B*.... .. ..Hudson, Wis
Chicago & Southeastern Ry. 4-8½ g. 110 m. 11 lo. 100 c.
H. Crawford, Jr., *Gen. Man. & Pur. Agt.*, Chicago, Ill.
J. W. Roberts, *M. M. & M. C. B*..Lebanon, Ind.
Chicago & Texas R. R. Co.
4-8½ g. 74 m. 10 lo. 244 cars.
O. L. Garrison, *V. P*............St. Louis, Mo.
S. L. Sherer, *Pur. Agt*.........St. Louis, Mo.
Geo. W. Underhill, *For. Car Shops*, Murphysboro, Ill.
Chicago & Western Indiana R. R. Co. and The Belt Ry. Co. of Chicago.
4-8½ g. 55 m. 45 l. 100 cars.
B. Thomas, *Pres. & Gen. Man*..Chicago, Ill.
C. C. Nash, *Pur Agt*.... ....Chicago, Ill.
P. H. Peck, *M. M*..................Chicago, Ill.
Choctaw, Oklahoma & Gulf Ry.
4-8½ g. 225 m. 13 lo. 1,087 cars.
Francis J. Gowen, *Pres. & Gen. Man.* Philadelphia, Pa.
H. E. Yarnall, *Pur. Agt.* So. McAlester, I. T.
J. Cunningham, *M. M* ...So. McAlester, I. T.
Cincinnati & Kentucky Southern Ry.
4-8½ g. 13 m. 2 lo. 51 c.
E. Ritchie, *Gen. Man. & P. A*....Cincinnati, O.
W. L. Peairs, *M. M*.. ....Yosemite, Ky
Cin. & Muskingum Valley Ry.
4-9 g. 148.5 m. 20 l. 414 c.
C. M. Bennett, *Supt*... ....Zanesville, O.
H. O. Hukill, *Pur. Agt* .....Pittsburgh, Pa.
Wm. Meikle, *Genl. For. Shops*....Lancaster, O.
Cincinnati & Northwestern Ry.
4-8½ g. 14 m. 2 lo. 40 cars.
R. Simpson *Gen. Man. & Pur. Agt.* Cincinnati, O.
O. K. Simpson, *M. M*.. ....Cincinnati, O.
Cincinnati & Westwood R. R. 4-8½ g. 9 m. 2 lo. 9 c.
J. N. Gamble, *G. M., S. & P. A*..Cincinnati, O.
Cin., Georgetown & Portsmouth. 3 g. 42 m. 5 lo. 75 c.
E. W. White, *G. M. & Pur. Agt*..Cincinnati, O.
J. M. Myers, *Supt*.......... ....Cincinnati, O.
P. T. Dunn, *F. of Shops & M. C. B.* Cincinnati, O.
Cincinnati, Hamilton & Dayton; Dayton & Mich.: Cin., Ham. & Ind.; Columbus, Findlay & Northern; Bowling Green, Cincinnati & Dayton R. R's.
4-8½ g. 641.82 m. 168 l. 8,405 cars.
Wm. M. Green, *Gen. Man*......Cincinnati, O.
G. R. Balch, *Pur. Agt*...........Cincinnati, O.
C. H. Cory, *Supt. M. P*....... .... Lima, O.
A. J. Ball, *Div. M. M*.... ....Dayton, O.
J. M. Percy, *Div. M. M*..........Cincinnati, O.
Cincinnati, Jackson & Mackinaw Ry.
4-8½ g. 346 m. 29 lo. 1,456 cars.
F. B. Drake, *Rec., Gen. Man. & P. A.* Toledo, O
A. H. Watts, *M. M*..... ....Marshall, Mich.
Cin., Leb. & North. Ry. 4-8½ g. 30 m. 6 l. 53 c.
Geo. Hafer, *Gen. Man. & P. A* ...Cincinnati, O.
Jos. Underwood, *M. M. & M. C. B.* Cincinnati, O.
Cincinnati, New Orleans & Texas Pacific Ry. Co. (*See Q. & C.*)
Cincinnati, Portsmouth & Virginia R. R.
4-8½ g, 112 m. 13 lo. 185 cars.
Sam'l Hunt, *Pres. & Gen. Man* Cincinnati, O.
T. Hunt, *Pur. Agt*.......... . Cincinnati, O
John C. Homer, *M. M. & M. C. B.* Portsmouth, O.
Cincinnati, Richmond & Chi. R. R. (*See C., St. L. & P.*)
Cincinnati, Saginaw & Mackinaw R. R. (*See C. & G. T. Ry. Co.*)
Cin., Wabash & Mich. Ry. (*See C., C., C. & St. L. R. R.*)
Clarendon & Pittsford Ry. 4-8½ g. 12 m. 3 l. 113 c.
F. D. Proctor, *Gen. Mgr*..........Proctor, Vt.
G. H. Davis, *M. M*...............Proctor, Vt.
E. J. Boyce, *Pur. Agt*.... .....Proctor, Vt.
Cleveland, Akron & Columbus Ry.
4-9 g. 177 m. 42 lo. 2 946 cars.
Calvin S. Brice, *Pres. & Pur. Agt.* Cleveland, O.
W. J. Vance, *M. M. & M. C. B*..Mt. Vernon, O.
Cleve, Cant. & South. R. R. 4-8¾ g. 210 m. 37 l. 2,708 c.
J. W. Wardwell, *Rec. & Man*.. Cleveland, O.
John Bean, *M. M. & M. C. B* .....Canton, O.
H. A. Kennedy, *Gen. Supt. & P. A*..Canton, O.
Cleveland & Marietta Ry. 4-8½ g. 105 m. 23 l. 1,008 c.
W. A. Baldwin, *Pres., G. M. & P. A.* Cambridge, O.
J. Glasser, *M. M*..... ... .Cambridge, O.
Cleveland & Pittsburgh. (*See Penna. Co.*)
Clev., Cinn., Chi. & St. Louis:
4-8½ g. 2,305 m. 526 lo. 17,415 cars.
C. E. Schaff, *Asst. Gen. Man*....Cincinnati, O.
A. M. Stimson, *Pur. Agt* ....Cincinnati, O.
William Garstang, *Supt. M. P* Indianapolis, Ind.
Cinn.-Sandusky Div.:
W. Gibson, *Supt*..... ....Springfield, O.
James A. Keegan, *M. M* ... . Delaware, O.
Clev. & Indianapolis Div.:
T. J. Higgins, *Supt*.......... ....Cleveland, O.
E. E. Hudson, *M. M*....... Bellefontaine, O.
St. Louis Div.:
E. M. Neel, *Supt*.................Mattoon, Ill.
G. S. McKee, *M. M* ....Mattoon, Ill.
Chicago Div.:
G. W. Bender, *Supt*..........Indianapolis, Ind.
F. M. Lawler, *M. M*...........Brightwood, Ind.
Cairo Div.:
W. P. Orland, *M. M*...........Mt. Carmel, Ill.
P. & E. Ry.: J. A. Barnard, *Gen. Man*...Urbana, Ill.
J. McClurg, *M. M*........ ....Urbana, Ill.
Mich. Div.: S. T. Blizard, *Supt*.... Wabash, Ind.
C. H. Doebler, *M. M*...... ......Wabash, Ind.
Cleveland, Lorain & Wheeling Ry.
4-8½ g. 192 m. 59 lo. 4,837 cars.
W. R. Woodford, *Gen. Man*.. .. Cleveland, O.
F. E. Now, *Pur. Agt*.... ....Cleveland, O.
James Graham, *M. M*.. .... Lorain, O.
F. H. Stark, *M. C. B*.................Lorain, O.
Cleveland Terminal & Valley R. R.
4-8½ g. 75 m. 30 lo. 1,060 cars.
J. T. Johnson, *Gen. Supt*.......Cleveland, O.
Y. Anderson, *Pur. Agt*.... ....Cleveland, O.
Colorado Eastern R. R. Co 3 g. 17 m. 2 lo. 13 cars.
C. M. Wicker, *Gen Man*...........Denver, Col.
R. McDowell, *Gen Pur. Agt*.. ...Denver, Col.
H. Twining, *M. M. & M. C. B*.....Denver, Col.
Colorado Midland Ry. 4-8½ g. 233 m. 51 l. 1,415 c. (*See A., T. & S. F. Rd.*)
Columbia & Greenville R. R. .....(*Rich. & Danville.*)
Columbia & Puget Sound R.R. (*See Oregon Improvement Co.*)
Columbus Southern Ry. 4-9 g. 88 m. 5 lo. 106 cars.
T. E. Blanchard, *Receiver* ..Columbus, Ga.
S. F. Parratt, *G. Man. & Pur. A.* Columbus, Ga.
H. C. Hill, *Supt*................Columbus, Ga.
J. McC. Hill, *M. M. & M. C. B*..Columbus, Ga.
Columbus, Sandusky & Hocking Ry.
4-8½ g. 267 m. 50 lo. 3,809 c.
N. Monsarrat, *Pres. & Rec*.... Sandusky, O.
Wm. Thornburgh, *Supt. & Pur. Agt.* Columbus, O.
Geo. F. Gardiner, *M. M & M. C. B.* Columbus, O.
Columbus & Rome R. R. (*See Cent. of Ga.*)
Columbus, Hocking Valley & Toledo Ry.
4-8½ g. 325 m. 114 lo. 8,552 cars.
C. B. Duffy, *Pur. Agt*...........Columbus, O.
S. S. Stiffey, *M. M* ....Columbus, O.
Colusa & Lake R. R. 3 g. 22 m. 3 lo. 30 cars.
E. A. Harrington, *Man., Supt. & P. A.* Colusa, Cal
M. E. Burrows, *M. M* ....Colusa, Cal.
T. Sullivan, *M. C. B*...............Colusa, Cal.
Concord & Montreal R. R.
4-8½ g. 530 m. 100 lo. 2,682 cars. (*See Boston & Maine.*)
Conn. Riv. R. R. 4-8½ g. 130 m. 55 lo. 688 c. (*See Boston & Maine.*)
Cooperstown & Charlotte Valley R. R.
4-8½ g. 25 m. 3 lo. 25 cars.
D. E. Siver, *Pur. Agt*.....Cooperstown, N. Y.
A. Gardner, *M. M*........ Cooperstown, N. Y.
Cornwall R. R., 4-8½ g. 31.1 m. 5 lo. 9 pass. c.
E. C. Freeman, *Gen. Man*.... ...Lebanon, Pa.
D. S. Hammond, *Supt. & Pur. Agt.* Lebanon, Pa.
A. J. Reed, *M. M*....... ....Lebanon, Pa.
Levi Blouch, *M. C. B* ....Lebanon, Pa.
Cornwall & Lebanon.
4-8½ g. 22 m 10 lo. 17 p. 540 ft cars.
A. D. Smith, *Gen. Supt. & P. A* Lebanon, Pa.
R. T. Spotten, *M. M*... ....Lebanon, Pa.
Coudersport & Port Allegheny R. R.
4-8½ g. 41 m. 3 lo. 80 cars.
B. A. McClure, *G. Supt. & P. A.* Coudersport, Pa
Cressen & Clearfield County and N. Y. Short Route (*See Pennsylvania Ry.*)
Crooked Creek R. R. & Coal Co.
4-8½ g. 24 m. 2 lo. 23 cars.
S. McClure, *Gen. Man*. ....Lehigh, Ia.
Cumberland & Maurice River Ry. (*See Cent. Ry. of N. J.*)
Cumberland & Penn. R. R. 4-8½ g. 55 m. 26 lo. 575 c.
Lewis M. Hamilton, *Gen Supt. & P. A.*, Cumberland, Md
H. T. Bruck, *M. M* ....Mt. Savage, Md.
Cumberland Valley R. R. 4-9 g. 166 m. 34 lo. 764 cars.
J. F. Boyd, *Supt. & P. A*....Chambersburg, Pa.
J. Lawrence, *M. M* ... ..Chambersburg, Pa.
C. Wicke, *M. C. B*...... ...Chambersburg, Pa.

D

Danville & Western R. R. 3 g. 83 m. 5 lo. 70 c
A. B. Andrews, *Pres*... ....Raleigh, N. C.
G. K. Griggs, *Supt. & Pur. Agt*..Danville, Va.
W. T. Whittaker, *M. M* ....Danville, Va.
Dayton & Michigan R. R. (*See Cin., Ham. & Day.*)
Delaware & Hudson Canal Co.
4-8½ g. 689 m. 333 lo. 18,648 cars.
H. G. Young, *2d V.-Pres*..... . Albany, N. Y.
J. White Sprong, *Pur. Agt*.......Albany, N. Y.
R. C. Blackall, *Supt. Mach*...... .Albany N. Y
Susq. Div.: C. D. Hammond, *A. Supt.* Albany, N. Y.
J. R. Skinner, *M. C. B*.. .....Oneonta, N. Y.
H. C. Smith, *M. M*......... Oneonta, N. Y.
Sar. & C. Divs.: C. D. Hammond, *Supt.* Albany, N. Y.
J. L. Cory, *M. M*.... ... . Green Island, N. Y
Chr. Körner, *M. C. B*.. ...Green Island, N. Y
Pa. Div.: C. R. Manville, *Supt*.... Scranton, Pa.
C. F. Rettew, *M. M*..........Carbondale, Pa.
T. Orchard, *M. C. B*....... ... Carbondale, Pa.
Del. Lackawanna & Western R. R.
4-8½ g. 901 m. 618 lo. 31,535 cars.
Wm. F. Hallstead *Gen. Man*.....Scranton, Pa.
W. D. Hager, *Pur. Agt*.. .....New York, N. Y.
D. Brown, *Mast. Mach*......... .Scranton Pa.
Robt. McKenna *M. C. B*... . .Scranton, Pa
Utica Div.: A. C. Salisbury, *Supt*....Utica, N. Y
Thos. Thatcher, *M. M*......... ...Utica, N. Y.
Morris & Essex Div.; Sussex.
A. Reasoner, *Supt*.. ....Hoboken, N. J.
W. H. Lewis, *M. M* ...... Kingsland, N. J.
J. W. Baker, *Mast. Car Rep*......Dover, N. J
Oswego & Syracuse Div.
A. H. Schwarz, *Supt*...... Syracuse, N. Y
L. Kistler, *M. M*.. . ...Syracuse, N. Y.
Syracuse, Binghamton & New York Div.
A. H. Schwarts, *Supt*.. ......Syracuse, N. Y
Lewis Kistler, *M. M*.......... Syracuse, N. Y
Div.: J. B. Marston, *Supt*...... .. Buffalo, N. Y.
F. B. Griffith, *M. M*........... ..Buffalo, N. Y.
Delaware River R. R. 4-8½ g. 20 m. 3 lo. 11 cars.
W. S. Conner, *Gen. Man*....Woodbury, N. J.
E. H. Green, *Supt. & P. A*..Pennsgrove, N. J.
J. B. Gilbert, *M. M*... .... Pennsgrove, N. J.
Denison & Washita Valley. 4—8½ 14 m. 1 lo. 119 c.
Thos. Fleming, *Supt*..... ....Denison, Tex.
Denver & Rio Grande Ry..
3 and 4-8½ g. 1,648.04 m. 290 lo. 7,142 c.
E. T. Jeffery, *Pres. & G. M* ... Denver, Col.
Henry Schlacks, *Supt. Mach*.....Denver, Col.
C. M. Hobbs, *Pur. Agt* ....Denver, Col.
Delaware, Susquehanna & Schuylkill R. R. Co.
4—9 g. 67.22 m. 29 lo. 1,521 cars.
Luther C. Smith, *Supt*. .... Drifton, Pa.
J. B. White, *Treas. & P. A*. .....Drifton, Pa.
A. J. Beltz, *M. M. & M. C. B*..... Drifton, Pa.
Des Moines & Kansas City Ry.
3 g. 112 m. 9 lo. 210 cars
John C. Newton, *G. M*...........Des Moines, Ia.
Theo. C. Sherwood, *S. & Pur. A.* Des Moines, Ia
E. Dawson, *M. M. & C. B*...... ...Osceola, Ia.
Des Moines, Northern & Western R. R.
4-8½ g. 156 m. 14 lo. 250 cars.
F. C. Hubbell, *Supt. & P. A*...Des Moines, Ia.
W. H. Whitaker, *M. M*........Des Moines, Ia.
Detroit & Mackinac R. R.
4-8½ g. 177½ m. 20 lo. 632 c.
J. D. Hawks, *V. P. & Gen. Man.* Detroit, Mich.
G. M. Crocker, *Pur. Agt* ....Detroit, Mich
H. T. Thomas, *M. M*. ....E. Tawas, Mich.
Det., Gr. H. & Mil. Ry. (*See Chi. & Gr. Trunk.*)
Det., Lansing & No'n and Saginaw Valley & St. Louis Rys. 4-8½ g. 378 m. 47 lo. 2,101 c.
Chas. M Heald, *Gen. Man*........Detroit, Mich.
R. Wallace, *Pur. Agt*...............Detroit, Mich.
B. Haskell, *Supt. M. P*....Grand Rapids, Mich.
Walter. T. Rupert, *M. M*......... ..Ionia, Mich
Dominion Atlantic Ry. 4-8½ g 234 m. 21 lo. 387 c.
W. R. Campbell, *Gen. Man*.. Kentville, N S.
W. Yould, *M. M*. .... Kentville, N S
W. Grierson, *M. C. B*...... ..Kentville, N. S.
Duluth, Red Wing & Southern.
4—8½, 28 m. 2 lo. 45 c.
L. F. Hubbard, *G. M. & Pur. Agt.* Red Wing, Minn.
H. D. McKay, *M. M* ....Red Wing, Minn.
J. Lyons, *M. C. B*.... .....Red Wing, Minn.
Duluth & Iron Range R. R.
4-8½ g. 154 m. 52 l. 2,326 c.
J. L. Greatsinger, *Gen. Man. & Pur. Agt.*, Duluth, Minn.
H. S. Bryan, *M. M. & M. C. B.* Two Harbors, Minn.
Duluth, Miss'be & North'n. 4-8½ g. 118.5 m. 26 lo. 1,483 c.
D. M. Philbin, *Gen. Man*. ...... Duluth, Minn.
S. R. Payne, *Pur. Agt*...........Duluth, Minn.
A. F. Priest, *M. M*....... ......Duluth, Minn.
Duluth, Mississippi River & Northern R. R.
4-8½ g. 100 m. 7 lo. 225 cars.
Duluth, South Shore & Atlantic Ry.
4-8½ g. 1,587.04 m. 95 lo. 3,808 c.
W. F. Fitch, *Gen. Man* .....Marquette, Mich.
P. W. Brown, *Pur. Agt* ......Marquette, Mich.
J. J. Conolly, *M. M*...........Marquette, Mich.
D. C. Mulvihill, *M. C. B*......Marquette, Mich.
Duluth & Winnipeg R. R.
4-8½ g. 113 m. 6 lo. 71 cars.
W. F. Fitch, *Rec. & Gen. Man.* Duluth, Minn.
P. W. Brown, *Pur. Agt*....Marquette, Mich
C. F. Ward, *M. M*............Cloquet, Minn.
Dunkirk, Allegheny Valley & Pittsburgh R. R. N. Y (Cen. & H. R. R. R Lesse)
4-8½ g. 91 m. 12 lo. 111 cars.
Chas. H. Ketcham, *Gen. Supt*. .Dunkirk, N. Y
Allen Bourn, *Pur. Agt* .. ....New York, N. Y.
W. G. Taber, *M. M. & C. B*....Dunkirk, N. Y.

E

Eagles Mere Ry. Co. 3 g. 8 m. 3 lo. 23 cars.
Geo. W. Fox, *Supt*............Sonestown, Pa.
East Alabama Ry. (*See Central of Ga.*)
East & West R. R. 4-9 g. 120 m. 12 lo. 145 c.
Chas. P. Ball, *Man. & Pur. A.* Cartersville, Ga.
B. F. Lowther, *M. M. & M. C. B.* Cedartown, Ga
East Broad Top R. R. & Coal Co. 3 g. 45 m. 8 lo. 321 c.
A. W. Greenwood, *Act. Supt., M. M. & P. A.*, Rockhill Furnace, Pa.
Eastern Kentucky R. R. 4-9 g. 36 m. 4 lo. 40 c.
H. W. Bates, *Gen. Man. & Pur. A.* Greenup, Ky.
A. W. Crawford, *M. M*..... ...... Grayson, Ky.
Eastern Ry. Co. of Minnesota: (*See Great Northern Ry.*)
East Tenn. & Western North Car. R. R
3 g. 34 m. 3 lo. 112 cars.
C. H. Nimson, *Gen. Supt*.....Cranberry, N. C.
W. Hahn, *Pur. Agt*..........Cranberry, N. C.
M. W. Lindamood, *M. M*..Johnson City, Tenn.
East Tennessee, Virginia & Georgia Ry. (*See Southern Ry. Co.*)
Elgin, Joliet & Eastern Ry.
4-8½ g. 170 m. 47 lo. 2,000 cars.
C. H. Ackert, *Gen. Man*...........Joliet, Ill.
R. A. Dugan, *Pur. Agt*..........Chicago, Ill.
John Horrigan, *M. M*....... ......Joliet, Ill.
E. T. Carlton, *M. C. B*.... ....Joliet, Ill.
Elgin & Havelock Ry. 4-8¾ g. 28 m. 2 lo. 12 c.
J. D. Chipman, *Man & P. Agt.* St. Stephen, N. B.
A. H. Robinson, *G. S. & P. A.* Petitcodiac, N. B.
W. W. Killam, *M. M. & M. C. B.* Petitcodiac, N. B.
Elmira, Cortland & Northern R. R.
4-8½ g. 140 m. 23 lo. 180 c.
Albert Allen, *Gen. Supt*... ....Cortland, N. Y.
M. A. Smith, *Pur. Agt*...... ....Elmira, N. Y.
Geo Richards, *M. M*.............Cortland, N. Y.
Erie & Huron Ry. 4-8½ g. 74 m. 5 l. 54 c.
J. J. Ross, *Gen Man. & P. A*.. .Chatham, Ont.
F. Stamelen *M. M*.............Chatham, Ont.
Erie & Pittsburgh R. R. (*See Penna. Co.*)
Erie & Wyoming Valley R. R. 4-8½ g. 78.22 m. 37 lo 1,186 c.
Geo. B. Smith, *Supt*. ....Dunmore, Pa.
S. D. King, *M. C. B*... .... Dunmore, Pa.
D. E. Barton, *M. M* .. ..Dunmore, Pa.
Eureka & Palisade R. R. 3 g. 84 m. 5 lo. 125 cars
D. J. Colton, *Gen. Supt & Pur. Agt.* Palisade, Nev.
E. W. Harris, *M. M*..............Palisade, Nev.
Eureka Springs Ry. 4-8½ g. 19 m. 2 lo. 8 cars.
Powell Clayton, *Gen. Man.* Eureka Springs, Ark.
C. H. Smith, *Pur. Agt*.........St. Louis, Mo.
J. B. Obenshain, *M. M*...Eureka Springs, Ark
Evansv. & Terre Haute and Evansville & Indianapolis R's. 4-8½ g 317 m, 55 lo. 4 268 c
H. C. Barlow, *P. & Gen. Man* Evansville, Ind.
A. L. Sanger, *P. A* ....Evansville, Ind.
John Torrence, *S. M. P. & R. S* Evansville, Ind.

F

Fall Brook Ry. 4-8½ g. 257 m. 84 lo. 3,000 c.
Fall Brook, Syracuse. Geneva & Corning; Pine Creek; Geneva & Lyons.
G. R. Brown, *Gen. Supt*.... ....Corning, N. Y.
W. H. Chaphe, *Pur. Agt*... ....Corning, N. Y
Wm. A. Foster, *Supt. Machy* .. Corning, N. Y
C. J. Butler, *M. C. B*.. ...... Corning, N. Y.
Farmville & Powhatan R. R. 3 g. 90 m. 5 lo. 124 c.
Jas. R. Werth, *Gen. Man*. .... Richmond, Va
W. B. Suother, *Pur. Agt*. ....Richmond, Va
C. K. Bowles, *M. M. & M. C. B* Chester, Va.
Findlay, Fort Wayne & Western R. R.
4-8½ g. 81 m. 5 lo. 84 cars.
C. M. Bissell, *Gen. Man & Pur Agt.* Fort Wayne, Ind.
A. W Stalder, *M. M*...... .....Findlay, Ohio.
Fitchburg R. R., 4-8½ g. 457.78 m. 204 lo. 6,437 c,
W. D. Ewing, *Gen. Supt*.........Boston, Mass
Geo. J. Fisher, *Pur. Agt*....... ..Boston, Mass.
J. Medway, *Supt M. P*...........Boston, Mass.
J. W. Marden, *Supt. Car Dept*..Boston Mass.
S. W. Simonds, *M. M*..........Boston, Mass.
Flint & Pere Marq.
3 & 4-8½ g. 777 m. 103 lo. 3,754 cars.
S. T. Crapo, *G. M*.....Saginaw, E. S., Mich.
H. D. Norris, *Pur. Agt*. .Saginaw, E. S., Mich.
F. J. Hatswell, *M M. & M C. B.* Sagin'w, E. S., Mich.
Florida Midland Ry. 4-8½ g. 45 m. 2 lo. 6 cars.
H. S. Chubb, *Rec* ....Kissimmee, Fla.
J. M. Booth, *Supt. & P. A*..Kissimmee, Fla.
Florida, Central & Peninsular R. R.
4-9 g. 940.77 m. 71 lo. 2,055 cars.
D. E. Maxwell, *G. M. & Pur. A.* Jacksonv'le, Fla
E. Burton, *M. M*........ ....Fernandina, Fla.
J. J. Bassenger, *M. C. B*.....Fernandina, Fla.
Florida Southern Ry. (*See Plant System*).
Fonda, Johnst'n & Gloversv. 4-8½ g. 26 m. 9 lo. 40 c
R. T. McKeever, *G. S. & Pur Agt.* Gloversville, N. Y.
F. E. Driscole, *M. M. & M. C. B.* Gloversville, N. Y.
Ft. Worth & Denver City Ry.
4-8½ g. 469 m. 32 l. 1,018 cars.
Morgan Jones, *Receiver*....Fort Worth, Tex.
J. V. Goode, *G. S. & Pur. Agt.* Ft. Worth, Tex.
E. W. Hayes, *Supt. M. P*...Fort Worth, Tex.
Fort Worth & Rio Grande Ry. 4-8½ g. 147 m. 9 l. 109 c.
John Hornby, *Pres., G S. & P. A.* Fort Worth, Tex.
H. D. Galbraith, *M. M. & M. C. B.* Ft. Worth, Tex
Franklin & Megantic R. R. 2 g. 25 m. 2 lo. 45 c.
V B. Mead, *Pres & Gen. Man*..Boston, Mass
P. H. Stubbs, *Pur. Agt* . ....Strong, Mass
W. S. Heath, *M. M. & M. C. B*...Salem, Me.
Fremont, Elkhorn & Mo. Val. R. R. (*See Sioux C. & Pac.*)
Fulton County N. G. Ry. 3 g. 61 m. 5 lo. 190 cars
S. H. Mallory, *Gen. Man* ....Chariton, Ia.
A. C. Atherton *Gen. Supt. & P. Agt*...Lewiston.

G

Gal., Harrisburg & San Antonio Ry. (*See So. Pac*
Galveston, La Port & Houston Ry.
4-8½ g, 56 m. 4 l. 188 c.
J. Waldo, *Pres. & Gen. Man*..Houston, Tex.
George's Creek & Cumberland R. R.
4-9 g. 33 m. 10 lo. 1,106 cars.
J. A. Millholland, *Pres., G. M. & P. A* Cumberland, Md.
Thos. McCann, *M. M. & M. C. B.* Cumberland, Md.
Georgia R. R 4-9 g. 303 m. 56 lo. 1,148 cars.
Thos. K. Scott, *G. M. & P. A*.....Augusta, Ga
John S. Cook, *M. M*...............Augusta, Ga
E. S. Scheetz, *M. C. B* . ...Augusta, Ga.
Georgia & Alabama Ry.
4-8½ g. 265 m. 25 lo. 1,310 cars.
Cecil Gabbett, *V. P. G. M. & P. Agt.* Americus, Ga.
J. E. Worswick, *M. M. & M. C. B.* Americus, Ga.
Georgia, Midland & Gulf R. R. 4-9 g. 100 m. 7 l. 250 c.
John F. Flournoy, *Receiver*.. Columbus, Ga.
C. W. Chears, *G. Man. & P. Agt.* Columbus, Ga.
J. D. McPhail, *M. M. & C. B*... Columbus, Ga
Georgia Southern & Florida R. R.
4-8½ g. 285 m. 29 lo. 967 cars.
W. B. Sparks, *Gen. Man*...... ....Macon, Ga.
J. Lane, *Supt*............ ....Macon, Ga.
Geo. D. Harris, *M. M. & M. C. B.* Macon, Ga
Gettysburg & Harrisburg R. R. (*See Phila. & Reading R. R.*)
Grafton & Upton R. R.. 4-8¼ g. 16¾ m. 3 lo. 6 c.
E. P. Usher, *Gen. Man*........Grafton, Mass.
Grand Rapids & Indiana. 4-9 g. 581 m. 73 lo. 3,229 c.
J. H. P. Hughart, *G. M*..Grand Rapids, Mich
W. R. Shelby, *Pur. Agt*....Grand Rapids, Mich.
J. E. Keegan, *M. M*......Grand Rapids, Mich.
Grand Tower & Carbondale. (*See Chicago & Tex.*)
Grand Trunk Ry. 4-8½ g. 3,512 m. 795 lo. 23,547 c.
L. J. Seargeant, *Gen. Man*.....Montreal, Can.
Jno. Taylor, *Gen. Storekeeper*...Montreal, Can
Herbert Wallis, *Mech. Supt*.. ..Montreal, Can.
Wm. McWood, *A. M. S. Car Dept.* Montreal, Can.
F. L. Wanklyn, *A. M. S. Lo. Works.* Montreal, Can.
J. D. Barnett, *A. M. S. Lo. Wks.* Stratford, Ont.
J. W. Harkom, *A. M. S. C. Div* ..Toronto, Ont.
A. H. Smith, *A. M. S. W. Div.*, London, Ont.
Great Northern Ry. line:
Great Northern Ry. Co.; Montana Central Ry. Co.; Willmar & Sioux Falls Ry. Co.; Duluth, Watertown & Pac. Ry. Co.; Pacific Coast lines.
Eastern Ry. of Minn.
4-8½ g. 4,488 m. 418 lo. 14,323 cars.
Chas. H. Warren, *Gen. Man*..St. Paul, Minn.
J. W. Blabon, *Pur. Agt*........St. Paul, Minn.
J. O. Pattee, *Supt. M. P*. ...St. Paul, Minn.
Green Bay, Winona & St. Paul R, R.
4-8½ g 250 m, 22 lo, 464 cars,
S. W. Champion, *G. M. & P. A.* Green Bay, Wis
A. Fenwick, *M. M*...... ......Green Bay, Wis.
Greenfield & Northern, R. R. (*See Kansas City, Fort Scott & Memphis R. R.*)
Green Pond, Walterboro & Branchville Ry.
4-9 g, 14 m, 1 lo, 2 cars.
C. S. Gadsden, *Supt*... ... Charleston, S. C.
W. F. Loughman, *Pur. Agt.* New York, N. Y.
Wm. Rutherford, *Supt. M. P & E.* Savannah, Ga.
G. M. D. Riley, *M. M*.. .... Savannah, Ga
Green Ridge R. R. of Maryland.
3 g. 26 m. 2 lo. 20 cars.
F. Mertens, *Pres. & P. A*..Cumberland. Md.
Greenwich & Johnsonville Ry. 4-8½ g. 15 m. 2 l , 5 c.
J. H. Thompson, *G. M.. G. S. & P. A* Gr'nwich, N. Y
Gulf, Beaumont & Kansas City R. R.
4-8½ g. 62 m. 5 l. 212 c.
John H. Kirby, *Gen. Man* ....Houston, Tex.
W. C. Averill, *Pur. Agt*.....Beaumont, Tex.
Jas. R. Smith, *M. M. & M. C. B.*, Beaumont, Tex.
Gulf & Chicago R. R. 3 g, 62½ m. 5 lo. 50 c.
C. L. Harris, *Gen. Man., G. S. & P A.* Ripley, Miss.
Jno. Reed, *M. M. & M. C. B*...Ripley, Miss.
Gulf, Col. & Sante Fe Ry. (*See A., T. & S. F Ry.*)
Gulf, W'n Texas & Pac. Ry. (*See Southern Pacific.*)

H

Hannibal & St. Jo. R. R. 4-8½ g, 295 m, 66 lo. 1,828 c.
W. C. Brown, *Gen. Man* ... ..St. Joseph, Mo.
Geo. Hargreaves, *Gen. Pur. Agt.* Chicago, Ill.
N. J. Paradise. *M. M.* Lines E. of Brookfield, Hannibal, Mo.
F. A. Chase, *M. M.* Lines W. of Brookfield, St. Joseph, Mo.
I. N. Wilbur, *Div. M. M*......Brookfield, Mo.
G. M. Shryock, *M. C. B*.........Hannibal, Mo.
Housatonic R. R. (*See N. Y., N. H. & H. R. R.*)
Houston & Tex. Cen. Ry. 4-8½ g. 510 m, 114 lo. 2,661 c.
G. A. Quinlan, *V P. & Gen. Man* Houston, Tex
Geo. Howes, *Pur. Agt*.......New York, N. Y.
S. R. Tuggle, *Supt. M. P & Ma*...Houston, Tex.
C. H. Burnes, *M. M*........ ... Houston, Tex.
James McGee, *M. C. B*....... Houston, Tex.
Houston, E & W. Tex. Ry.
4-8½ g, 192 m, 18 lo, 496 cars.
M. G. Howe, *V. P. & Gen. Man.* Houston, Tex.
A. S. Grant, *M. M & M. C. B*.... Houston, Tex.
N. S. Meldrum, *Pur. Agt*........Houston, Tex.
Humeston & Shenandoah R. R.
4-8½ g, 113 m. 18 lo. 80 cars.
E. C. Murphy, *G. M., Rec. & P. Agt.*, Clarinda, Ia.
G. Knapp, *M. M. & C. B* ..... Shenandoah, Ia.
Huntingdon & Br. Top Mt. R. R.
4-9 g, 63 m. 24 lo. 2,699 c.
Geo. F. Gage, *Gen. Man*.....Huntingdon, Pa.
Samuel B. Knight, *Pur. Agt*..Philadelphia, Pa.
C. R. Yohn, *M. M*................ Saxton, Pa.
Hutchinson & Southern Ry. 4-8½ g, 82 m, 3 l, 28 c.
Byron Roberts, *Rec* .... Hutchinson, Kan.
G. S. Roberts, *Supt. R. S. & R. M.*, Hutchinson, Kas.

I

Illinois Central R.R. 4-8½ g. 2,888 m, 610 lo. 17,367 c.
A. W. Sullivan, *Gen. Supt* ... .Chicago, Ill.
C. A. Beck, *Pur. Agt*...... .....Chicago, Ill.
Wm. Renshaw, *Supt. of Mach*....Chicago, Ill
J. J. Casey, *Asst. Supt, M. P*...Chicago, Ill.
Wm. Apps, *M. C. B*..............Chicago, Ill.
(1) Northern Lines:
J. C Hartigan, *Asst. G. Supt* .. Chicago, Ill.
Chic. Div.: H. Baker, *Supt*.......Centralia, Ill.
J. W. Luttrell, *M. M*.........Burnside, Ill.
J. H. Pollard, *M. M*..... Centralia, Ill.
Amboy Div.: H. McCourt, *Supt*...La Salle, Ill.
J. S. Chambers *M. M*... ....Clinton, Ill.
Springfield Div.:
D. S. Bailey, *Supt*.... .... Clinton, Ill.
J. S. Chambers, *M. M* ....Clinton, Ill.
Freeport Div.:
W. J. Harrahan, *Supt*...... Freeport, Ill.
E. O. Dana *M. M*... ....Freeport, Ill.
Dubuque Div.:
F. B. Harriman, *Supt*... ......Dubuque, Ia.
T. W. Place, *M. M*.. ....Waterloo, Ia.
Cherokee Div.: C. K. Dixon, *Supt.*.Cherokee, Ia.
T. W. Place, *M. M*... .. ....Waterloo, Ia.
(2) So. Lines:
M. Gilleas, *Asst. G. S. Southern Lines*, Memphis, Tenn.
Miss. Div.: W. S. King, *Supt*...Jackson, Tenn.
Wm. Hassman, *M. M*....Water Valley, Miss.
La. Div.: O. M. Dunn, *Supt*....New Orleans, La.
F. C. Lasey, *M. M*. .....McComb City, Miss.
Memphis Div.: J. B. Kemp, *Supt.* Memphis, Tenn.
J. J. O'Rourke, *M. M*........Memphis, Tenn.
Indiana & Illinois Southern R.R. 4-9 g, 91 m. 6 l, 109 c.
P. H. Blue, *Gen Man. & P. Agt.* Sullivan, Ind.
M. E. Hotchkiss, *M. M*.... ......Palestine, Ill.
Indiana, Illinois & Iowa R.R.
4-8½ g, 193.51 m, 25 l. 239 c.
T. P. Shonts, *Gen. Man. & Pur. Agt.* Chicago, Ill
L. H. Miller, *M. M. & M. C. B.*.Kankakee, Ill.
Indianapolis & St. Louis R. R, (*See C., C. C & St. L.*)
Indianapolis & Vincennes R. R, (*See Penn. Co.*)
Indiana, Decatur & Western Ry.
4-8½ g, 153 m, 18 lo, 762 c
R. B. F. Pierce, *Gen. Man*..Indianapolis, Ind.
C. B. McVay, *Pur. Agt*......Indianapolis, Ind.
J. McKenna, *M. M*......... Indianapolis, Ind.
Intercolonial Ry. of Canada.
4-8½ g, 1,142 m, 206 lo, 6,844 c.
David Pottinger, *Gen. Man*....Moncton, N. B
T. V. Cooke, *Pur. Agt* ....Moncton, N. B.
F. R. F. Brown, *Mech. Supt*..Moncton, N. B.
D. White, *Gen. Car Foreman*..Moncton, N.
International & Great Northern Ry.
4-8½ g, 825 m, 109 lo. 1,788 cars.
T. M. Campbell, *Gen. Man*.....Palestine, Tex.
F. Hufsmith, *M. M*.......... Palestine, Tex.
W. E. Williams, *Pur. Agt*.... Palestine, Tex.
Interoceanic Ry. 3 g, 519 m, 64 lo 964 cars.
G. M. Stewart, *Act. Gen. Man.* Texcoco, Mex.
C. A. Crail, *Pur Agt*...... .... Texcoco, Mex.
E V Sedgwick, *Supt. M. P.* City of Mexico, Mex.
W. Cockfield, *Supt. Loco. & Car Service*, Pueblo, Mex.
E. M. Ruth, *M. C. B*........ . Texcoco, Mex.
Iowa Central Ry. 4-8½ g, 498 m, 66 lo, 2,255 cars.
Col. L. M. Martin, *G. M*....Marshalltown, Ia.
S. M. Rogers, *Pur. Agt*....Marshalltown, Ia.
B. Reiley, *M. M*...... ....Marshalltown, Ia.
E. E. Carver, *M. C. B*.....Marshalltown, Ia.
Iron Ry. 4-8½ g, 20 m, 4 lo, 214 cars.
C. C. Clarke, *Gen. Man*...... ......Ironton, O.
B. S. J. Garvey, *Pur. Agt*.........Ironton, O.
G. A. Meyers, *M. M*...............Ironton, O.
B. Martin, *M. C. B*.... . ...Ironton O.
Irondale, Bancroft & Otawa Ry.
4-8½ g, 30 m, 3 lo, 35 cars.
Chas. J. Pusey, *Gen. Man. & Pur. Agt.*, Irondale, Ont.
Ironton R, R. 4-8½ g. 12 m. 2 lo.
W. Andrews, *Gen. Supt*....... Allentown, Pa.
D. W. McFetridge, *Pur. Agt.*, Hokendauqua, Pa.
S. R. Thomas, *M. M*.......Hokendauqua, Pa.

J

Jacksonville, St. Augustine & Indian River Ry., operating Atlantic & Western Ry. of Florida.
4-9 g. 339 m. 27 lo. 150 cars.
R. T. Goff, *Supt*....... ...St. Augustine, Fla.
J. D. Wright, *Pur. Agt*...... New York, N. Y.
Geo. A. Miller, *M. M*.......St. Augustine, Fla.
Jacksonville, Tampa & Key West Ry.
4-9 g. 200 m. 26 lo. 510 cars.
Joseph H. Durkee, *Receiver.* Jacksonville, Fla.
W. B. Coffin, *G. S. & P. A.* Jacksonville, Fla.
F. E. Tubbs, *M. M* ....Palatka, Fla.
Jamestown & Lake Erie Ry. Co.
4-8½ g. 26 m. 4 l. 14 cars.
E. S. Haines, *Gen. Man*....Jamestown, N. Y.
W. A. Stinchcomb, *G. S. P. A.* Jamestown, N. Y.
W. J. Davis, *M. M. & M. C. B.*, Jamestown, N. Y.
Jeffersonv., Mad. & Ind. R. R. (*P., C., C. & St. L. Ry.*)

K

Kanawha & Michigan Ry. ..4-9 g. 168 m. 15 l. 600 c. (*See Ohio Central lines.*)
Kansas City, St. Joseph & Council Bluffs.
4-8½ g. 308 m. 44 lo. 1,038 c.
W. C. Brown, *Gen. Man*..... St. Joseph, Mo.
Geo. Hargreaves, *Pur. Agt*..... Chicago, Ill.
F. A. Chase, *M. M*.. ....St. Joseph, Mo.
T. Aylesbury, *M. C. B*.......St. Joseph, Mo.
Kansas City & Independence Rapid Transit Ry
4-8½ g. 23 m. 8 lo. 38 cars.
C. F. Holmes, *Gen. Man*......Kansas City, Mo.
W. A. Saterlee, *Pur. Agt*....Kansas City, Mo.
C. Wiseman, *M. M. & M. C. B.* Kansas City, Mo.
Kansas City, Osceola & Southern Ry.
4-8½ g. 112 m. 11 lo. 314 c.
B. S. Josselyn, *G. M. & P. A*......Clinton, Mo.
C. A. Burdick, *M. M*...........Clinton, Mo.
S. F. Gentry, *M. C. B*....... ....Clinton, Mo

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NATIONAL MALLEABLE CASTINGS CO.,
1525 Old Colony Bldg., Chicago, Ill.

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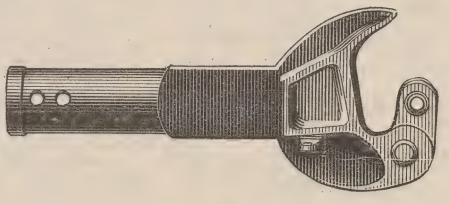
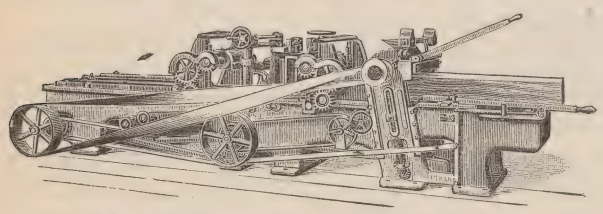
THE JANNEY FREIGHT CAR COUPLER



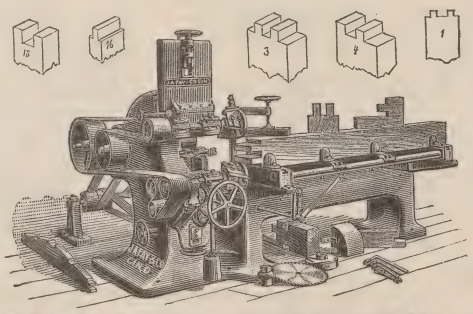
THE McCONWAY & TORLEY COMPANY

W. McCONWAY—PRESIDENT.

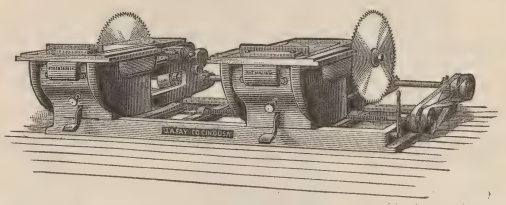
48th ST. & A.V.R'Y.—PITTSBURGH, PA.



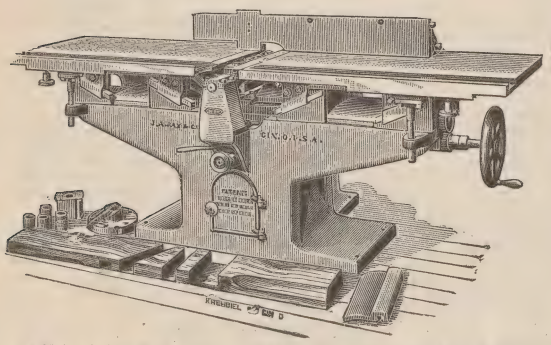
No. 2 Extra Heavy Large Car Sill and Timber Dressing Machine.



No. 5 Patent Universal Car Tenoning Machine.

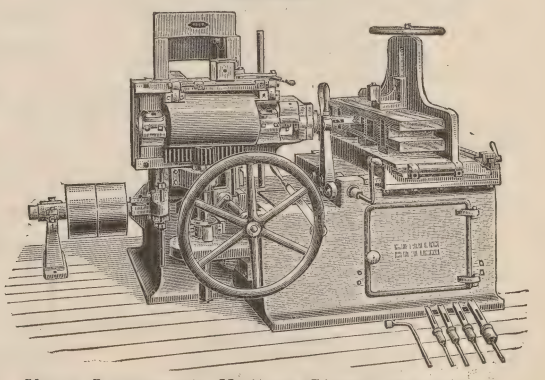


No. 3 Automatic Patent Double Cutting-Off Machine.



No. 4 Large Patent Variety Wood-Worker.

WOOD REDUCING MACHINERY
FOR CAR BUILDERS.
HIGHEST HONORS WHEREVER EXHIBITED.
PLANS, SPECIFICATIONS AND ESTIMATES ON APPLICATION.
J. A. FAY & CO.
515 to 535 W. FRONT ST., CINCINNATI, O.



No. 3 Automatic Hollow Chisel Mortising and Boring Machine.

Kansas City, Fort Scott & Memphis, Kansas City, Clinton & Springfield and Current River Rys.
4-8½ g. 915 m. 186 l. 7,625 c.
Geo. H. Nettleton, *Gen. Man*Kansas City,Mo.
H. P Jacques, *Pur. Agt*....Kansas City. Mo.
W. A. Nettleton, *S.M.P.&M.*,Kansas City, Mo.
A. N. Monteer, *M. C. B*........Springfield, Mo.
Jas. Bissett, *M. M* ....Springfield, Mo
Kansas City Memphis & Birmingham R. R.
4-8½ g. 276 m. 41 lo. 1,798 c.
Geo. H. Nettleton, *Gen. Man*...Kan. City, Mo.
H. P. Jacques, *Pur. Agt*....Kansas City, Mo.
W. A. Nettleton, *Supt. M. P. & M.*
.Kansas City, Mo.
R. H. Briggs, *M. M*..........Memphis, Tenn.
Kansas City, Pittsburgh & Gulf R. R.
4 ft. 8½ in. g. 260 m. 25 l. 650 cars.
E. L. Martin, *P. & Gen. Man* Kansas City, Mo.
A. L. Howe, *Asst. Pur. Agt*.Kansas City. Mo.
T. D. Woodhouse, *M. M. & M. C. B.*
Pittsburgh, Kan.
Kansas City, Watkins & Gulf Ry.
4-8½ g. 100 m. 9 lo. 239 cars.
Thos. Saunders, *Gen. Man*..Lake Charles, Ia.
J. B. Watkins, *Pur. Agt*..Lake Charles, La.
J. C. Ramsey, *M.M.&M.C.B.* Lake Charles, La.
Kent Northern Ry. 4-8½ g 45 m. 4 lo. 31 cars.
W. Brown, *Gen. Man*..... Richibucto, N. B.
T. Murray, *Supt. & M. C. B.*Richibucto, N. B.
E. Animaux, *M. M*...... ....Richibucto, N. B.
Kentucky & Indiana Bridge Co.
4-8½ g. 15 m. 5 lo. 14 cars.
John MacLeod, *Rec*............Louisville, Ky.
F. W. Tracy, *Rec*.............Springfield, Ill.
S. M. Felton, *Rec*.............Cincinnati, O.
K. MacLeod, *Pur. Agt*.......Louisville, Ky.
J. Newhouse, *M.M*.............. Louisville, Ky.
L. Fogleman, *M. C. B*...........Louisville, Ky.
Kentucky Midland Ry. 4-8½ g. 40 m 4 l. 35 c.
Geo. B. Harper, *Rec.,S.&P.A.* Frankfort, Ky.
M. Horton, *M. M* ....Frankfort, Ky.
Kentucky & South Atlantic Ry. (*See Chesapeake & Ohio Ry. Co.*)
Kentucky Central Ry. (Operated by L. & N. R. R.)
Keokuk & Western R. R. 4-8½ g. 148 m. 14 l. 955 c.
A. C. Goodrich, *G. M. & Pur. Agt*.Keokuk, Ia.
W. Augustus, *M. M. & M. C. B.*Centerville, Ia.
Kickapoo Valley & Northern Ry. Co.
4-8½ g. 34 m. 2 lo. 14 cars.
W. H. Thomson, *G. M.& P.A.* Wauzeka, Wis.
Kings Co. Elevated Ry. 4-8½ g. 8½ m. 44 lo. 145 c.
W. T. Goundie, *Gen. Man., Supt. & Pur. Ag.*,
Brooklyn, N. Y
W. F. Thompson. *M. M*........Brooklyn, N. Y
W. S. Sutton, *M. C. B*....... Brooklyn, N. Y.
Kingston & Pembroke Ry. 4-8½ g. 113 m. 9 lo. 198 c.
Jos. Bawden, *Receiver*.... .. .Kingston, Ont.
B. W. Folger, *Gen. Man.* ....Kingston, Ont.
J. Whitsbread, *Pur. Agt*......Kingston, Ont.
F. Clark, *M. M*...... ....Kingston, Ont.
D. Nesbith, *M. C. B*............Kingston, Ont.
Knoxville & Augusta R.R, 4-8½ g. 16m 2 lo. 30cars.
W. P. Hood, *Gen. Supt.& P.A* Knoxville, Tenn.
John L. Bradford, *M. M* . Knoxville, Tenn.
W. C. Bruce, *M. C. B*........Knoxville, Tenn.
noxville, Cumberland Gap & Louisville,
4-9 g. 81.80 m, 12 lo. 450 cars.
C. Cary, *Rec*.................
L. F. Wynne, *Gen. Supt*....Knoxville, Tenn.
H. G. Fraser, *Pur. Agt*....Knoxville, Tenn.
B. J. Sitton, *M.M*.......... Middlesboro, Ky.
H. Clark, *M. C. B*...........Knoxville, Tenn.

L

Lake Champlain & Moriah Ry.
4-8½ g. 16 m. 9 lo. 326 cars.
A. E. Tower, *G. M. & P. A.* Poughkeepsie, N. Y.
C. P. Morrison, *M. M*......Port Henry, N. Y.
R. C. Smith, *M. C. B*........Port Henry, N. Y.
Lake Erie, Alliance & So'n Ry. 4-8½g. 36m. 1 l. 74c.
E. E. Scranton, *Rec.,M.&P.Agt*....Alliance, O.
C. P. Finch, *M. C. Repairer*......Alliance, O.
Lake Erie & Detroit River Rd.
4-8½ g. 108 m. 8 lo. 218 c.
E. C. Walker, *Man. Dir*.... Walkerville, Ont.
Alex. Leslie, *Pur. Agt*.......Walkerville, Ont.
S. Austin, *Mech. Supt*......Walkerville, Ont.
Lake Erie & West'n R. R. and Ft. Wayne, Cin. & Louisville Ry. 4-8½ g. 725 m. 120 lo. 5,531 c.
Geo. L Bradbury, *V.P.&G.M.* Indianapolis, Ind.
T. H. Perry, *Pur. Agt*......Indianapolis, Ind.
P. Reilly, *Supt Equipment* ......Lima, O.
Lake Shore & Michigan So'n Ry.
4-8½ g. 1,448 m. 579 lo. 20,140 cars.
D. W. Caldwell, *Pres*...........Cleveland, O.
Chas. B. Couch, *Pur. Agt*.......Cleveland, O.
G. W. Stevens, *Supt. M. P.* .....Cleveland, O.
A. M. Waitt, *Gen. M. C. B*......Cleveland, O.
A. A. Bradeen, *M. M*........... Cleveland, O.
East'n Div.: T. W. Niles, *Supt*... Buffalo, N. Y.
E. E. Elden, *M. M*.... ....Buffalo, N. Y.
A. C Robson, *M. C. B*.... ...Buffalo, N. Y.
Geo. N. Dow, *M. C. B*..........Cleveland, O
Frank. Div.: A. H. Smith, *Supt*. Youngstown, O.
Toledo Div.: J. K. Russell, *Supt* .Cleveland, O.
J. O. Bradeen, *M. M*..... ......Norwalk, O.
J. R. Reniff, *M. C. B*....... ....Norwalk, O.
Mich. Divs.: L. E. Johnson, *Supt*.... Toledo, O.
F. O. Bray, *M. C. B*.............Adrian, Mich.
Det. Brs.: S S. Hand, *Supt*.......Detroit, Mich.
Lansing, Ypsilanti & Ft. Wayne Branches:
H. A. Worcester, *Supt*. ..Hillsdale, Mich.
Western Div.: A. B. Newell, Supt...Chicago, Il.
W. L. Gilmore, *M. M*..... .....Elkhart, Ind.
T. Fildes, *M. C. B*.... ..... .Englewood, Ill.
Lakeside & Marblehead Ry. 4-8½g 10 m. 2 lo. 11 c.
C. E. Gowen, *G. M. & P. A*.....Cleveland, O.
W. M. Harsh, *G. S*... ....Cleveland, O.
Lancaster, Oxford & Southern R.R. 3g, 20m. 2 l. 23c,
A. M. Nevin, *Gen. Man. & P. A*...Oxford, Pa.
Lebanon Springs R. R. 4-8½ g. 58 m. 4 lo. 18 cars.
Wm. V. Reynolds, *Rec*.......Bennington, Vt.
E. D. Bennett, *Supt.&Pur.Agt.* Bennington, Vt.
S. Hawley, *Act.M.M.& M.C.B.* Chatham, N. Y.
Lehigh & Hudson River Ry. 4-8½g. 90m. 23 lo. 744c.
Grinnell Burt, *Gen. Man*......Warwick, N. Y.
E. M. Reynolds, *Pur. Agt*....Warwick, N. Y.
F. W. Mast...., *M. M*.... ....Warwick, N. Y.
Lehigh & Lackawanna R.R. (*See Cent. R.R. of N. J.*)
Lehigh Valley R. R. 4-8½g. 1,057.7 m. 685 lo. 55,410c.
R. H. Wilbur, *Gen. Supt*..So. Bethlehem, Pa.
Samuel Higgins, *Supt.M.P.* So. Bethlehem, Pa.
W. C. Alderson, *Pur. Agt*..Philadelphia, Pa.
J. I. Kinsey, *M. M*.... ....So. Easton, Pa.
Phillip Wallis, *M. M*...........Hazleton, Pa.
F. Roth, *M. M*... ....Wilkes-Barre, Pa.
J. N. Weaver, *M. M*.................Sayre, Pa.
John Campbell, *M. M* ....Buffalo, N. Y.
John S. Lentz, *Supt. Car Dept.* Packerton, Pa.
Lexington & Eastern Ry. Co.
4-9 g. 94 m. 8 lo. 373 cars.
J. D. Livingston, *G.M.&P.A.*, Lexington, Ky.
Geo. F. Foster, *M. M.&M.C.B.*, Lexington, Ky.
Ligonier Valley R. R. 4-9 g. 11 m. 3 lo. 19 cars.
Thos. A. Mellon, *Gen. Man*..... Ligonier, Pa.
Geo. Senft, *S.P.A., M.M.& M.C.B*..Ligonier, Pa
Little Miami Ry. (*See P., C. & S. L.*
Little Rock & Fort Smith. (*See Mo. Pac.*
Lit. Rock & Memphis R.R. 4-8¾g. 135m. 16 lo. 350c.
R. Fink, *G. M. & P. A*.....Little Rock, Ark.
C. Robkin, *M. M*.. ....Argenta, Ark
A. Waldo, *M. C. B*................Argenta, Ark
Little Saw Mill Run R. R 4-8½ g. 3 m. 4 lo. 178c.
R. W. Jones, *Gen. Man*........Pittsburgh, Pa.
C. Schoeneman, *Pur. Agt*......Pittsburgh, Pa.
J. Richards, *M. M*..... ...... Banksville, Pa.
Jas. Easton, *M. C. B*...... ..Banksville, Pa.
Litchfield, Carrollton & Western Ry. Co.
4-8½ g. 58 m. 2 l. 36 cars.
C. H Bosworth, *Receiver*.....Springfield, Ill.
T. D. Hinchcliffe, *Gen. Man*..Carlinville, Ill.
F. C. Dodds, *Pur. Agt*........Springfield, Ill.
W. E. Roberts, *M. M*...... ....Carrollton, Ill.
Live Oak & Gulf Ry. 4-9g, 21 m, 1 lo., 3 cars.
C. J. McGehee, *Gen. Man*.....Live Oak, Fla.
Chas. W. White, *Pur. Agt*.......Citra, Fla.
C. M. Ingals, *M. C. B*.......Live Oak, Fla.
Long Island R. R. 4-8½ g. 360 m. 148 lo. 1,740 cars.
E. R. Reynolds, *Gen. Man.* Long Island City, N.Y.
G. L. Hubbell, *Pur. Agt.* Long Island City, N.Y.
S. F. Prince, Jr., *S.M.P.& E.* Morris Park, N.Y
Los Angeles Terminal Ry.
4-8½ g. 51 m. 8 lo. 171 cars.
T. B. Burnett, *P. A. & G.M.* Los Angeles, Cal.
T. R. Shanks, *M.M.&M.C.B.* Los Angeles, Cal.
Louisville & Nashville R. R.
4-9 g. 3,159 m. 540 lo. 20,104 cars.
J. G. Metcalfe, *Gen. Man*.... .Louisville, Ky.
P. P. Huston, *Pur. Agt*.........Louisville, Ky.
P. Leeds, *Supt. Mach*..........Louisville, Ky.
A. Beckert, *Gen. M. M*... .New Decatur, Ala.
Kent. Cen. Div.: L. Hood, *Supt*...Cincinnati, O.
Wm. Adair, *M. M*...............Covington, Ky.
Louisv., Cin. & Lex. Div.:
C. A. Davies, *Supt*.... ...... E. Louisville, Ky.
Wm. Adair, *M. M*............E. Louisville, Ky.
Lou. Div.: W. S. Martin, *Supt*.. .Louisville, Ky.
J. G. Clifford, *M. M*............Louisville, Ky.
Nash. Div.: J. Geddes, *Supt*....Nashville, Tenn.
R. Moran, *M. M*............Bowling Green, Ky.
Alabama Mineral R. R.
W. E. Knox, *Supt*............Anniston, Ala.
J. H. Watters, *M. M*..........Anniston, Ala.
Mob. & M.: Div. Pens. & Sel. R. Rs.:
J. I. McKinney, *Supt*.. . ..Montgomery, Ala.
H. Minto, *M. M*......... ....Mobile, Ala.
Pensacola Div.:
E. O. Saltmarsh, *Supt*. ....Pensacola, Fla.
C. F. Giles, *M. M*...............Pensacola, Fla.
Memp. Line Div.: L. S. Robertson, *S.* Memphis, Tenn.
J. V. Slusser, *M. M*............Memphis, Tenn.
St. L. & Hend. Div:
B. F. Dickson, *Supt*..... .....Evansville, Ind.
Thos. Walsh, *M. M*......... .....Howell, Ind.
Louisville, Evansville & St. L. Consolidated R. R.
5 ft. 9 in. g. 378.78 m. 65 lo. 2,448 cars.
E. O. Hopkins, *Gen. Man*.....Evansville, Ind.
H. W. Matters, *Pur. Agt*........Princeton. Ind.
J. F. Sechler, *M. M.* .... Princeton, Ind.
W. E. Looney, *M. C. B*.......Princeton, Ind.
Louisville, New Albany & Corydon.
4-8½ g. 11 m. 2 l. 3 cars.
M. J. O'Connor, *Gen Man*......Corydon, Ind.
G. W. Briffett, *S.P.A.&M.M* .Corydon, Ind.
Louisville, New Albany & Chicago Ry.
4-8½ g. 537 1/10 m. 97 lo. 6,077 cars.
W. H. McDoel, *V. Pres.& Gen. Man.* Chicago, Ill.
J. H. Craig, *Auditor & Pur. Agt.* Chicago, Ill.
Henry Watkeys, *M. M*......New Albany, Ind.
Chas. Collier, *M. C. B*.......New Albany, Ind.
Louisville, New Orleans & Tex. Ry. (*See Ill. Central*)
Louisville, St. Louis & Texas Ry.
4-9 g. 186 m. 18 lo. 768 cars.
Attilla Cox, *Rec*........ ....Louisville, Ky.
A. M. McCracken, *Gen. Sept*... Louisville, Ky.
C. P. Bush, *Pur. Agt*.............Louisville, Ky.
F. J. Ferry, *M. M*.......... ...Cloverport, Ky.

M

Macon & Northern. 4-8½ g. 107 m. 6 lo. 460 cars.
Col. Wm. H. Ross, *Receiver*.. ...Macon, Ga.
A. H. Porter, *Supt* ....Macon, Ga.
W. A. Carey, *M. M. & M. C.B*....Macon, Ga.
Macon, Dublin & Savannah.
4-8½ 54 m. 2 lo. 47 cars.
J. T. Wright, *Gen. Man*....:......Macon, Ga.
P. Hough, *Pur. Agt*................Macon, Ga.
D. B. Dunn, *G. S., M. M. & M. C. B.*,
Macon, Ga.
Maine Central R. R. 4-8½g. 821m. 157 lo. 3,409 c.
Payson Tucker, *V.-Pres. & G.M.*.Portland. Me.
A. S. Bosworth, *Supply Agt*....Portland, Me.
Amos Pilsbury, *Supt. M. P*.....Portland, Me.
John Ellis, *M. M*..............Waterville, Me.
C. H. Kenison, *M. C. B*..........Portland, Me.
Manhattan Ry. 4-8½ g. 36 m. 331 lo. 1,116 c.
Frank K. Hain, *V.-Pres., G. M. & P. A.*,
New York, N. Y.
M. McNally, *M. M*...........New York, N.Y.
H. A. Webster, *M. C. B* ......New York, N.Y.
Manistee & Luther Ry. 3 g. 60 m. 6 lo. 240 cars.
R. G. Peters, *Gen. Man*.... ...Eastlake, Mich.
H. W. Carey, *Pur. Agt*.. .....Eastlake, Mich.
T. J. Peach, *M. M. & M. C. B.* Eastlake, Mich.
Manistee & North East'n Ry. 4-8½g. 109m. 9 lo. 295c.
Edward Buckley, *Gen. Man*...Manistee, Mich.
J. M. Peterson, *Pur. Agt*......Manistee, Mich.
Wm. H. Nuttall, *S.M.P.&R.S*..Manistee, Mich.
E. N. Weist, *M. C. B*..........Manistee, Mich.
Maricopa & Phœnix R. R. 4-8½ g. 34.28 m. 3 l. 56 c.
F. I. Kendall, *Pur. Agt*....San Francisco, Cal.
M. S. Webb, *M. M*..................Phœnix, Ariz.
T. J. Morrison, *M. C. B*......Phœnix, Ariz.
Marietta & North Georgia R. R.
4-9 g. and 3 ft. g. 231 m. 231 m. 18 lo. 250 c.
J. B. Glover. *Receiver*...........Marietta, Ga.
J. B. Glover, Jr., *S. M. P*..........Marietta, Ga.
Mason & Oceana Ry. 3 g. 27 m. 7 lo. 225 cars.
M. McDermott, *Gen. Supt* ...Ludington, Mich.
O. Wrege, *M. M* ....Ludington, Mich
J. Johnson, *M. C. B*.... ....Ludington, Mich.
Mason City & Ft. Dodge R.R. 4-8½g. 92 m. 6 l. 151c.
C. C. Burdick, *G. M. S. & P. A.* Fort Dodge, Ia.
R. H. Emerson, *M. M. & C. B.* Fort Dodge, Ia.
Massillon & Cleve. Ry. (*See Penna Co.*)
Meadville & Linesville Ry. (*See Pitts. Shen. & Erie Ry.*)
Memphis & Charleston R.R. 4-9 g. 330m. 39 l. 1,049c.
R. B. Pegram, *Gen. Supt* ...Memphis, Tenn.
J. P. Minetree, *Pur. Agt*..Washington, D. C.
J. H. Buckalew, *M. M*........Memphis, Tenn.
R. T. Hayes, *M. C. B*.... ....Memphis, Tenn.
Mexican Ry. 4-8½ g. 321 m. 59 lo. 743 cars.
Geo. Foote, *Gen. Supt* ....Mexico, Mex.
H. G. Evans, *Loco. Supt*....... Mexico, Mex.
Mexican Central Ry. 4-8½g. 1,859.83m. 151 lo. 2,912c.
F. P. McIntyre, *Pur. Agt* ... ...Boston, Mass.
H. R. Nickerson, *Gen. Man*....City of Mexico.
F. W. Johnstone, *Supt.M.P.&M.* City of Mexico.
J. H. O'Brien, *M. C. B*.........City of Mexico.
P. O. Address of all Officers in Mexico is El Paso, Texas.)
Mexican International R. R.
4-8½ g. 616 m. 46 lo. 1,487 cars.
L. M. Johnson *Gen. Man.*,
Ciudad Porfirio Diaz, Mex.
W. Hollis, *Mat. Agt.* Ciudad Porfirio Diaz, Mex.
W. Jennings, *Supt. Mech. Dept.*,
Ciudad Porfirio, Diaz, Mex.
Mexican National R.R. 3 g. 1,218 m. 122 lo. 2,538 c.
E. N. Brown, *Gen. Man*....... City of Mexico.
A. Anderson, Jr., *Pur. Agt*..New York, N. Y.
Thos. Milan, *S. M. P. & Mach*...Laredo, Tex.
Northern Division:
J. N. Galbraith, *Supt*...... .....Laredo, Tex.
J. Farrell, *M. M*...................Laredo, Tex.
San Luis Potosi Div.:
A. Clarke, *Supt*.......San Luis Potosi, Mex.
M. J. Schneider, *M. M*...San Luis Potosi, Mex.
Southern Div.:
V. R. Dwinell, *Supt*......City of Mexico, Mex.
Richard Fitzsimmons, *Act. M. M.* Sant'go, Mex.
Michoacan & Pacific Ry.
3 g. 60 m. 5 lo. 100 cars.
A. Atwood, *Gen. Man*.......Maravatio, Mex.
L. R. Gordon, *Supt. & P. A*..Maravatio, Mex.
J. O. Nicholas, *M.M.&M.C.B.* Maravatio, Mex.
Michigan Cen. R. R. 4-8½g. 1,633m. 461 lo. 14,121c.
H. B. Ledyard, *Pres. & Gen. Man.* Detroit, Mich.
Robt. Miller, *Gen. Supt*..........Detroit, Mich.
J. R. Dutton, *Pur. Agt*..........Detroit, Mich.
C. E. Smart, *Gen. M. M*.... ...Jackson, Mich.
E. D. Bronner, *M. C. B*..........Detroit, Mich.
(1) Lines West of Detroit River:
East., Toledo & Bay City Divs.:
D. S. Sutherland, *Supt*..........Detroit, Mich.
P. Miller, *M. M*...................Detroit, Mich.
Sag. & Mack. Div.:
W. J. Martin, *Supt*.... ....Bay City, Mich.
M. Ryan, *M. M*... ... .Bay City, Mich.
Mid. Air Line: Gr. Rap. and So. Hav. Divs.:
O. F. Jordan, *Supt*...............Jackson, Mich.
West & Joliet Divs.:
J. H. Snyder, *Supt*.................Chicago, Ill.
J. G. Riley, *M. M*..................Chicago, Ill.
(2) Lines East of Detroit River:
Canada & Mich. Mid. Divs.:
J. B. Morford, *Supt*......... ..St. Thomas, Ont.
M. L. Flynn, *M. M*..........St. Thomas, Ont.
R. Potts, *Gen. F. C. Dept*....St. Thomas, Ont.
Middle Georgia & Atlantic Ry.
4-8½ g. 65 m. 5 lo. 9 cars.
J. W. Preston, *G.M.& Pur. Agt* Eatonton, Ga
Millen & Southern. 4-8½ g. 32 m. 4 lo. 13 cars
J. F. Gray, *Supt. & P. A*..........Millen, Ga.
F. W. Reavey, *M. M*...............Millen, Ga.
Mineral Range and Hancock & Calumet Rys.
3 g. 54.21 m. 16 l. 462 cars.
W. F. Fitch, *Gen. Man*....Marquette, Mich.
J. C. Shields, *Supt*............Hancock, Mich.
P. W. Brown, *P. A*.... .....Marquette, Mich.
J. J. Conolly, *M. M*.........Marquette, Mich.
C. Angee, *M. C. B*.... ......Hancock, Mich.
Midland No. Car Ry. (*See Atl. Coast Line.*)
Milwaukee & Northern R.R.
(*See C., M. & St. P. Ry. Co.*)
Milwaukee, Lake Shore & Western Ry. Co.
(*See Chicago & Northwestern.*)
Minneapolis & St. Louis Ry.
4-8½g. 583 m. 69 lo. 2,500 cars.
A. L. Mohler, *Gen. Man*...Minneapolis, Minn.
T. E. Clarke, *Gen. Supt*....Minneapolis, Minn.
S. M. Lohren, *Pur. Agt*....Minneapolis, Minn.
J. Tonge, *M. C. B. & M. M*..Minneapolis, Minn.
Minneapolis, St. Paul & Sault Ste. Marie.
4-8½ g. 1 160 m. 103 lo. 5,978 cars.
F. D. Underwood, *Gen. Man.* Minneapolis, Minn.
T. A. Switz, *Pur. Agt*......Minneapolis, Minn.
E. A. Williams *Mech. Supt.* Minneapolis, Minn.
Mississippi River & Bonne Terre Ry
4-8½ g. 74 m. 9 lo. 110 cars.
J. Burns, *Supt*....... ......Bonne Terre, Mo.
G. Setz, *P. A*...................Bonne Terre, Mo.
J. F. Kehrmon, *M.M.&M.C.B.* Bonne Terre, Mo.
Mississippi R. & No. West. Ry. 4-8½g. 12m. 2 lo. 35c.
A. Kimball, *G. M. & Supt.* Arkansas City, Ark.
P. Kimball, *P. A*..........Arkansas City, Ark.
E. Kroger, *M. M*.........Arkansas City, Ark.
Missouri, Kansas & Texas Ry.
4-8½ g. 2,073.1 m. 246 lo. 110 pass. c., 7,529 c.
Thos. C. Purdy, *V.-P. & G.M.*.St. Louis, Mo.
C. N. Stevens, *Pur. Agt* ....St. Louis, Mo.
Wm. O. Herin, *Supt. M. P*.....Parsons, Kan.
C. T. McElvany, *M. M*...........Dallas. Tex.
J. Doyle, *M. C. B*..................Dallas, Tex.
Sam'l Irvin, *Supt. Car Dept*.... Sedalia, Mo.
Missouri Pacific Ry. System, including Missouri Pac. Ry., St. Louis, Iron Mountain and Southern Ry. and leased, operated and independent lines. 4-8½ g. 5,380 m. 641 lo. 23,072 cars.
Wm. B. Doddridge, *Gen. Man*..St. Louis, Mo.
F. Rearden, *Supt. Loco. & Car Depts.*,
St. Louis, Mo.
A. Gould, *Pur. Agt*.......... ....St. Louis, Mo.
L. Bartlett, *Div. M. M*..........St. Louis, Mo.
S. P Weller, *Div. M. M*......... Sedalia, Mo.
W. T. New, *Asst. M. M*....Kansas City, Kan.
W. J. Hill, *Div. M. M*......Osawatomie, Kan.
J. T. Jones, *Asst. M. M*......Ft. Scott, Kan.
Central Branch Union Pac. Ry.
4-8½ g. 388.19 m. 35 lo. 564 ft. cars, 23 pass. cars.
H. G. Clark, *Gen. Supt*........St. Louis, Mo.
C. W. Weller, *Div. M. M*.... Atchison, Kan.
St. Louis, Iron Mountain & Southern Ry.
4-8½ g. 1,773.47m. 255 lo. 9,486 ft. cars, 131 pass. c.
E. A. Peck, *Gen. Supt*.... .... St. Louis, Mo.
W. H. Harris, *M. M*.... ....De Soto, Mo.
Mord. Roberts, *M. M*......Baring Cross, Ark.
M. B. Schaffer, *Gen. F. C. D*..St. Louis, Mo.
Mobile & Birmingham R. R. Co.
4-9 g. 163 m. 13 lo. 268 cars.
T. G. Bush, *Gen. Man* .. ....Anniston, Ala.
J. D. Clark, *Supt. & Pur. Agt*..Mobile, Ala.
Mobile & Ohio R. R. 4-8½ g. 687 m. 106 lo. 3,952 c.
John G. Mann, *Gen. Man*..........Mobile, Ala.
R. H. Duesberry, *Pur. Agt*.......Mobile, Ala.
M. T. Carson, *Supt. Machy*..Jackson, Tenn.
J. D. Gurganus, *M. C. B*.......Whistler, Ala.
St. L. Div.: H. W. Clarke, *Supt*. Ea. St. Louis, Ill.
A. B. Minton, *M. M*.... ...Murphysboro, Ill.
G. Manuel, *M. M*...............Jackson, Tenn.
D. O. Smith, *M. M*..............Whistler, Ala.
Mohawk & Malone Ry. (*See N.Y. C. & H. R. R.R.*)
Moncton & Buctouche Ry. 4-8½ g. 32 m. 2 l. 38 c.
E. G. Evans, *Gen. Man* .... Moncton, N. B.
W. P. Laudry, *M. M*........Moncton, N. B.
Monongahela River R. R. 4-8½ g. 33 m. 7 l. 1,135 c.
H. G. Bowles, *G.M.&P.A*....Monongah, W. Va.
J. B. Dorsey, *M.M.&M.C.B*...Watson, W. Va.
Monson R. R. 2 g. 6.16 m. 2 lo. 19c.
J. F. Kimball, *Gen. Man*.... ....Wilton. N. H.
W. L. Estabrooke, *Pur. Agt*.....Monson, Me.
H. E. Morrill, *M.M.&M.C. B*....Monson. Me.
Montana Central Ry. 4-8½ g. 253 m. 21 lo. 835 c.
(*See Great Northern.*)
Montana Union Ry. Co 4-8½ g. 72 m. 29 l. 369 c.
Wm. H. Burns, *Gen. Man. & P. A* Butte Mont.
G Lindoff, *M. M. & M. C.B.* Anaconda, Mont.
Monterey & Mex. Gulf. Ry. 4-8½ g. 390m. 127 lo. 595c.
Arthur Monom, *Gen. Man*...Monterey, Mex.
E. Des Essarts, *Pur. Agt*.....Monterey, Mex.
H. Nollau, *Chief of M. P*.....Monterey, Mex.
F. C. Barron, *M.M.& M.C.B.* Monterey, Mex.
Montour R. R. 4-8½ g. 12 m. 2 lo. 260 cars
U. A. Andrews, *Gen. Man.&P.A.* Pittsburgh, Pa.
L. S. Young, *Supt*........ ......Imperial, Pa.
Jas. Nelson, *M. M. & M. C. B*....Imperial. Pa.
Montpelier & Wells Riv. R.R. 4-8½ g. 45 m. 6 lo. 120 c.
W. A. Stowell, *Gen. Man*.......Montpelier, Vt.
F. W. Morse, *Pur. Agt* ... .Montpelier, Vt.
G. Jacobson, *M. M*.......... ..Montpelier, Vt.
C. F. Robinson, *M. C. B*.... ..Montpelier, Vt.
Morgan's Louis. & Tex. R.R. (*See Southern Pacific.*)
Mount Washington R. R. 4-7½ g. 3 m. 7 lo. 10 cars.
D. C. Prescott, *Gen. Man*.....Concord, N. H.
W. H. Alexander, *Pur. Agt*....Concord, N. H.
John Horne, *M. M. & M.C. B.* Lakeport, N. H.

N

Narragansett Pier R. R. 4-8½ g. 8½ m. 2 lo. 16 c.
G. T. Lanphear, *Supt.& Pur. Agt.* Peacedale, R.I.
E. Gardner, *M. M*...... ......Peace Dale, R. I.
Nashville, Chattanooga & St. Louis Ry.
4-9 g. 902.24 m. 163 lo. 4,624 cars.
J. W. Thomas *G. Man*.........Nashville, Tenn.
J. W. Thomas, Jr., *Pur. Agt.*, Nashville, Tenn.
James Cullen, *M. M. & C.B*...Nashville, Tenn.
Natchitoches & Red River Valley R. R. Co.
4-8½ g. 16 m. 2 lo. 11 cars.
L. Caspari, *G. Man. & P. A.* Natchitoches, La
Nelson & Fort Sheppard Ry.
(*See Spokane Falls & Northern Ry. Co.*)
Nevada, California and Oregon Ry. 3g. 80 m. 4 lo 50 c.
E. Gest, *Gen. Man*............ .. .Reno, Nev
Nevada Central R. R. 3 g. 93 m. 3 lo. 41 c.
W. J. Phillips, *Gen. Man. & P.A*..Austin, Nev.
J. C. Slater, *M. M. & M. C. B.*
Battle Mountain, Nev
Nevada County N. G. R. R. 3 g. 23 m. 3 lo. 60 cars
John F. Kidder, *G. Man.&P.A.* Grass Valley, Cal.
Jas. McCormick, *M. M. & C. B.* Grass Valley, Cal.
New Brunswick & Prince Edward Island Ry.
4-8½ g. 36 m. 3 lo. 37 cars.
Josiah Wood, *Gen. Man*......Sackville, N. B.
F. C. Harris, *Supt., P.A & M.M.* Sackville. N. B.
Newburg, Dutchess & Conn. R. R.
4-8½ g. 58 miles, 7 l. 132 c.
John S. Schultze, *Gen. Man. & P. A.*
Matteawan, N. Y
Gilman D. Holmes, *M. M. & C. B.*,
Dutchess Junction, N. Y.
New Jersey & New York Ry.
4-8½ g. 45 m. 11 lo. 116 c.
J. D. Hasbrouck, *Gen. Man. & P.A.*,
Jersey City, N. J.
J. S. Drake, *Supt*............. ..Hillsdale, N. J.
Thos. B. Russum, *M. M*......Hillsdale, N. J.
L. B. Van Wagner, *M. C. B*......Hillsdale. N. J.
New London Northern R. R. (*See Central Ver.*)
New Mexico & Arizona. (*See A. T. & Santa Fe R. R.*)
New Orleans, Fort Jackson & Grand Isle R. R.
4-8½ g. 61 m. 5 lo. 59 cars.
J. S. Landry, *Supt. & P. A*..... ...Algiers, La.
C. S. Burgis, *M. M. & M. C. B*.....Algiers, La.
New Orleans & Northwestern Ry.
4-8½ g 102 m. 7 lo. 70 cars
L. K. Hyde, *Rec. & G. M*....Natchez, Miss.
C. G. Vaughn, *Pur. Agt*...... Natchez, Miss.
New Orleans & Southern R.R. 4-8½ g. 66 m. 6 l. 68 c.
G. S. Taylor, *Rec*.............New Orleans, La.
F. E. Sprague, *Supt. & Pur. Agt.*
New Orleans, La.
Newport News & Miss. Val. Co. (*See Ch. & O. S. W.*)
4-9 g. 413 m. 92 l. 3,659 cars.
Newport & Sherman's Valley.
3′ g. 31 m 4 lo, 62 cars.
D. Gring, *Gen. Man.&Pur. Agt.* Newport, Pa.
C. C. Allen, *M. M*.... .. ..Newport, Pa.
N. Y. & Greenwood Lake Ry. (*See N. Y., L. E. & W.*)
New York & New England R. R.
4-8¾ g. 527 m. 212 lo. 6,640 cars.
J. T. Odell, *Gen. Man*...........Boston, Mass.
Edward Mahler, *Pur. Agt*. ......Boston, Mass.
Thomas Kearsley, *M. M*..... Norwood, Mass.
N.&W. Div.: J. N. King, *Supt*.. Providence, R. I.
S. F. Whaley, *M. M* . ..... Norwich, Ct
New York & Northern. 4-8½ g. 61 m. 21 lo. 345 c.
(*See N. Y. Central.*
N. Y. Central & Hudson River R.R.
4-8½ g. 967 m., 844 lo. 1,049 pass. c., 26,791 frt. c.
J. M. Toucey, *Gen. Man*...... New York, N. Y.
A. Bourn, *Pur. Agt*.......... New York, N. Y.
Wm. Buchanan, *Supt. M. P*.. New York, N. Y.
Jas. Buchanan, *Asst.S.M.P.* West Albany, N.Y.
G. H. Hazelton, *Asst. Supt. M. P.*.Depew, N.Y
Mohawk Div.:
J. R. Leonard, *Supt*..........Albany, N. Y.
Geo. Van Tassell, *M. M*.....New York, N. Y.
Jas. Buchanan, *M. M*......W. Albany, N. Y.
F. W. Chaffee, *M. C. B*....W. Albany, N. Y.
W'n Div.: J. P. Bradfield, *Supt*...Buffalo, N. Y.
S. L. White, *M. M*....... .... Syracuse, N. Y.
Amos Gould, *M.M*.... .....E. Buffalo, N. Y.
J. Macbeth, *M. C. B*.... ....E. Buffalo, N. Y.
Peter Smith, *M. C. B*......E. Rochester, N. Y.
N. Y. Chic. & St. L. R.R. 4-8½ g. 523 m. 148 lo. 7,197 c.
A. W. Johnston, *Gen. Supt*...... Cleveland, O.
M. M. Rodgers, *Pur. Agt* ....Cleveland, O.
John Mackenzie, *Supt. M. P* .....Cleveland, O.
Eas'tn Div.: W. L. Blair, *Supt*.....Conneaut, O.
E. A. Miller, *M. M*.. . ...Conneaut. O.
West'n Div.: C. D. Gorham, *Supt*. Ft. Wayne, Ind.
Geo. James, *M. M*..........Stony Island, Ill.
New York, Lake Erie & Western R. R.
4-8½ g. 2,061 m. 673 lo. 666 pass. c. 29,185 frt. c.
E. B. Thomas, J. G. McCullough, } *Recs*.. .New York, N. Y.
A. E. Mitchell, *Supt. M. P*....New York, N. Y.
E. B. Sheffer, *Pur. Agt*.. .... New York, N. Y.
N. Y., L. E. & W. Div.:
H. F. Baldwin, *Eng. M. of W.* Jersey City, N.J.
East Div.: M. W. Maguire, *Supt*, Jersey City, N.J.
H. A. Childs, *M. M*....... Jersey City, N. J.

Del. Div.: W. L. Derr, *Supt*...Port Jervis, N. Y.
J. Hainen, *M. M* ....Port Jervis, N. Y.
Susq. Div.: J. F. Maguire, *Supt*... Elmira, N. Y.
I. Bond, *M. M*...... ......Susquehanna, Pa.
Buff. & S. & S. W. Div.:
C. A. Brunn, *Supt*.... ... .Buffalo, N. Y.
J. H. Moore, *M. M*..............Buffalo, N. Y.
Robert Gunn, *For. C. Rep* .....Buffalo, N. Y.
Roch. Div.: G. A. Thompson, *Supt*. Rochester, N.Y.
M. M... ....Rochester, N. Y.
W'n Div.: H. E. Gilpin, *Supt*. Hornellsville, N.Y
C. P. Weiss, *M. M*.......Hornellsville, N. Y.
Tioga Div.: E. E. Loomis, *Supt*...Elmira, N. Y.
Bradford Div.: C. V. Merrick, *S*...Bradford, Pa.
C. P. Weiss, *M. M*...... ....Bradford, Pa.
N. Y. & Greenwood L. Ry.
4-8½ g. 51 m. 1 lo. 23 pass. c. 20 frt. c.
N. R.R. of N. J. Div.: 4-8½ g. 26 m. 20 p.c.
B. E. Moody, *Supt*..........Jersey City, N. J.
N. Y., Pa. & O. Div.
4-8½ g. 599 m. 247 lo. 141 pass. c. 9,279 frt. c.
A. M. Tucker, *Gen. Man* ......Cleveland, O.
J. C. Moorhead, *Gen. Supt*......Cleveland, O.
W. Lavery, *Asst. Supt. M. P*..Cleveland, O.
1st & 2d Div.: I. Belnap, *Supt*....Meadville, Pa.
M. M......... ..Meadville, Pa.
3d & 4th Divs.: C. A. Allen, *Supt*.... Galion, O.
A. W. Ball, *M. M*... ....Galion, O.
Maho'g Div.: H. N. Donaldson, *Supt*. Youngstown, O.
George Donahue, *M. M* ....Cleveland, O.
New York, New Haven & Hartford R. R.
4-8½ g. 1,441.88 m. 705 lo. 13,403 cars.
C. H. Platt, *Gen. Supt* ... .New Haven, Conn.
H. A. Bishop, *Pur. Agt*...... New Haven, Ct.
Lewis Wyler, *M. M*..........Hartford, Conn.
J. W. Leary, *M. M*........New Haven, Conn.
J. F. Brady, *M. M*......Harlem River, N. Y.
Old Colony System:
J. Henney, Jr., *Supt. M.P*..New Haven, Conn.
E. G. Allen, *Gen. Supt*.........Boston, Mass.
R. W. Husted, *Pur. Agt*.........Boston, Mass.
F. M. Twombly, *M. M*... .....Boston, Mass.
S. P. Willis, *M. M*........ ......Boston, Mass.
A. W. Twombly, *M. M*.......Taunton, Mass.
L. M. Butler, *M. M*..... .....Providence, R. I.
N.Y., Ontario & West. Ry. 4-8½ g. 477m. 133 lo., 6,269c.
J. E. Childs, *Gen. Man* ....New York, N. Y.
Chas. A. Draper, *Pur. Agt*....New York, N. Y.
Geo. W. West, *Supt. M. P*... Middletown, N.Y.
N.Y., Pennsylvania & Ohio R. R. (*See N.Y., L.E.& W.*)
New York, Philadelphia & Norfolk R. R.
4-8½ g. 112 m. 16 lo. 615 c.
W. A. Patton, *V.P.G.M.&P.A.* Philadelphia, Pa.
C. O. Skidmore, *M. M.&M. C.B.* Cape Charles, Va.
New York, Providence & Boston R. R. See N. Y., N. H. & H. R. R.
N.Y., Susqueh'na & W'n. 4-9 g. 157.75 m. 71 lo. 3,539 c.
Chas. D. McKelvey, *Gen. Supt.* Jersey City, N. J.
C. T. Demarest, *Pur. Agt*.....Jersey City, N.J.
W. C. Ennis, *M.M. & C. B.* North Paterson, N. J
Norfolk, Albemarle & Atl. 3 g. 18 m. 4 lo. 49 c
B. P. Holland, *Supt.& Pur. Agt.* Norfolk, Va.
R. D. Whitehorn, *M. M*.... .... Norfolk, Va.
F. O. Clibourne, *M. C. B*...........Norfolk, Va.
Norfolk & Ocean View R. R. Co.
4-9 g. 12 m. 2 lo. 16 c.
Wm. A. Barritt, Jr., *G. Man.* Ocean View, Va.
T. J. Kilpatrick, *M. M*.....Ocean View, Va.
G. W. McNichols, *M.C.B*..Ocean View, Va.
Norfolk & Western R. R. 4-9 g. 1,567m. 416 lo. 17,968c.
F. J. Kimball, *P. & Rec*....Philadelphia, Pa.
Henry Fink, *Receiver* .....Philadelphia, Pa.
Jos H. Sands, *V.P. & Gen. Man*..Roanoke, Va.
Wn. G. Div.:
E. T. Burnett, *Pur. Agt*.............Phila., Pa.
L. P. Ligon, *M. M*......... Bluefield, W. Va.
S. K. Dickerson, *M. M*....East Radford, Va.
R. H. Soule, *Supt. M. P.M.&C.B.* Roanoke, Va.
John Cullman, *M. M*........Portsmouth, Va.
N. W. Norsworthy, *M. M*.........Crewe, Va.
Norfolk & Southern R. R. 4-8½ g. 113 m. 13 lo. 282 c
M. K. King, *Gen. Man*.... ....Norfolk, Va.
I. P. Jernigan, *Pur. Agt*..........Norfolk, Va.
G. R. Joughins, *S. M. P*........ ..Berkley, Va
R. W. Barrett, *M. C. B*.... ......Berkley, Va)
North-Eastern R. R. (S. C.) (*See A. Coast Line.*
Northern New York R.R. 4-8½ g. 57 5 m. 6 lo. 515c.
C. B. Hibbard, *Pres. & Gen. Man.*
Tupper Lake, N. Y.
E. Lalime, *Supt., Pur. Agt.& M.M.& M.C.B.*
Santa Clara, N. Y.
Northern California R. R. (*See So. Pac. Co.*)
Northern Central Ry. (*See Penna. R. R.*)
Northern Ohio Ry. 4-8½ g. 165 m. 11 lo. 345 cars.
Geo. L. Bradbury, *Gen. Man.* Indianapolis, Ind.
T. H. Perry, *Pur. Agt*.....Indianapolis, Ind.
P. Reilly *Supt. Equipment*......Lima, Ohio.
North'n Pacific R. R. 4-8½g. 4,497m. 633 lo. 18,930c.
E. H. McHenry, *Receiver*....St. Paul, Minn.
F. L. Bigelow, *Receiver*....Milwaukee, Wis.
J. W. Kendrick, *Gen. Man*....St. Paul, Minn.
W. G. Pearce, *Asst. Gen. Man*...St. Paul, Minn.
F. C. Prest, *Pur. Agt*........St. Paul, Minn.
J. Hickey, *Supt. M. P., M. & R. S.* St. Paul, Minn.
Minn. Div.:
A. E. Law, *Supt*..........Minneapolis, Minn.
S. L. Bean, *M. M*.... ....Brainerd, Minn.
Dak. Div.: C. J. Wilson, *Supt*...Jamestown, Dak.
F. N. Risteen, *M. M*............... Fargo, Dak.
Manitoba Div.:
G. W. Vanderslice, *Sup*. Winnipeg, Manitoba.
J. T. Ford, *M. M*........Winnipeg, Manitoba.

Missouri and Yellow Stone Div.:
F. E. Potter, *Act. Supt*.....Glendive, Mont.
M. M.... .Glendive, Mont.
Montana Div.:
J. D. Finn, *Supt* ....Livingston, Mont.
Angus Brown, *Div. M.M*..Livingston, Mont.
R. M. Div.: E. J. Pearson, *Supt*.Missoula, Mont.
W. S. Clarkson, *M. M*.. ....Missoula, Mont.
Idaho Div.: F. W. Gilbert, *Supt*.Sprague, Wash.
Wm. Moir, *M. M*..............Sprague, Wash.
Pac. Div.:
Jos. McCabe, *Supt*...........Tacoma, Wash.
H. H. Warner, *M. M*..........Tacoma, Wash.
North Pacific Coast R. R. 3 g. 94 m. 12 lo. 391 cars.
J. B. Stetson, *G. M*........San Francisco, Cal.
W. F. Russell, *Pur. Agt* ...San Francisco, Cal.
W. J. Thomas, *M. M. & M. C. B*.Sausalito, Cal
Northwestern Ohio Ry. (*See Pa. Co.*)
North Galveston, Houston & Kansas City Ry.
(*See Galveston, La Port & Houston Ry*

O

Ohio Central Lines:
Toledo & Ohio Central Ry. 4-8½ g. 359 m. 85 lo. 6.494 cars.
Kanawha & Michigan Ry. 4-8½ g. 168 m. 15 lo. 600 cars.
J. M. Ferris, *Gen. Man*.... ....Toledo, O.
H. A. Cooper, *Pur. Agt* ....Toledo, O.
J. B. Morgan, *M. M. & M. C. B.* Bucyrus, O.
Ohio & Big Sandy R. R. (*See C. & O. Ry. Co.*)
Ohio & Mississippi Ry. (*See B. & O. Southwestern*).
4-9 g. 636 m. 124 lo. 3,823 cars
Ohio River R. R. 4-8½ g. 223 m. 26 lo. 1,300 cars.
Geo. A. Burt, *G. M. & P. Agt*. Parkersburg, W. Va.
A. Courtrite, *M. M*...... Parkersburg, W. Va.
Ohio Southern R. R. 4-9 g. 225 m. 30 lo. 6,265 c
J. R. Megrue, } *Receivers*....Springfield O
J. E. Matthews, }
A. S. Dunham, *Gen. Man*.....Springfield, O.
C. H. Roser, *Pur. Agt*..........Springfield, O.
H. M. Sehrt, *M. M. & M. C. B*.Springfield, O.
Ohio Valley Ry. (*See C. & O. Southwestern*).
4-9 g. 136 m. 11 l. 346 c.
Old Colony R. R. 4-8½ g. 603 m. 238 lo. 4,917 cars.
(*See N. Y., N. H. & H.*)
Omaha & St. Louis Ry. 4-8½ g. 145 m. 15 lo. 450 c.
John F. Barnard, *G. M. & Pur. A*. Stanberry, Mo.
F. P. Boatman, *M. M. & M. C B*. Stanberry, Mo
Oregon & California R. R. (*See Southern Pac. Co.*
Oregon Improvement Co., owning and operating Columbia & Puget Sound R. R., Pacific Coast Ry., Seattle & Northern Ry. and Port Townsend Southern R. R.
3 and 4-8½ g. 212 m. 22 lo. 535 cars.
C. J. Smith, *Gen. Man. & Rec*..Seattle, Wash.
W. E. Nichols, *Pur. Agt*...... .Seattle, Wash.
D. O'Leary, *M. M*. ... .Seattle, Wash.
Oregon Central & Eastern R. R.
4-8½ g. 138 m. 15 lo. 332 cars.
Edwin Stone, *Man*.... ....Corvallis, Ore.
Charles Clark, *Supt. & Pur. Agt*. Corvallis, Ore.
H. E. Chipman, *M. M. & M. C. B*. Yaquina, Ore.
Ottawa & Gatineau Ry.
4-8½ g. 60 m. 4 lo. 50 cars.
P. W. Resseman, *Gen Supt*...Ottawa, Ont.
H. L. Maltby, *Pur. Agt*......Montreal, Can.
Jas. Kay, *M. M. & M. C. B*....Ottawa, Ont.

P

Pacific Coast Ry. Co. 3 ft. g. 76 m. 6 lo. 193 cars.
C. O. Johnson, *Supt. & Pur. Agt.*,
San Luis Obispo, Cal.
J. Lind, *M.M. & M.C.B*. San Luis Obispo, Cal.
Paducah, Tennessee & Alabama R. R. & Tenn. Midland Ry 4-8½ g. 255 m. 18 l. 585 cars.
W. J. Hills, *Supt & Pur. Agt*...Paducah, Ky.
C. G. Potter, *M. M*.............Paducah, Ky.
Panama R. R. 5 g. 48 m. 38 lo. 914 cars.
Geo. Whaley, *Vice Pres. & Gen. Man.*
New York, N. Y.
J. R. Shaler, *Supt*.............Colon, Rep Co.
G. Reynaud, *Pur. Agt*.........New York, N. Y
D. G. Mott, *M. M & M. C. B*..Colon, Rep. Col.
Pecos Val. & Pecos River R.R. 4-8½ g. 165m. 6 l. 8 c.
Jeff. N. Miller, *G. M. & P. A*. Eddy, New Mex.
G. F. Miller, *M.M. & M.C.B*. Eddy, New Mex.
Pennsylvania & North Western R. R.
4-9 g. 73 m. 45 lo. 1,320 cars.
F. S. Lewis, *Gen. Man. & Pur. Agt*..Phila., Pa.
Geo. Van Brunt, *M. M*.... .... .Bellwood, Pa.
A. Zimmerman, *M. C. B*.... .. Bellwood, Pa.
Pennsylvania Company operating
Pitts., Fort Wayne & Chicago; Massillon & Clev So. Chi. & South'n; State Line & Indiana City; Pittsburgh, Youngstown & Ashtabula; Cleve. & Pitts.; Erie & Pitts.; Newcastle & Bea. Val., and T. W. V. & O.; Pittsburgh, Ohio Valley & Cincinnati.
4-9 g. 1,076 m. 508 lo. 35,648 cars.
Gen. Divs. (1), (2), (3), (4) and (5).
J. T. Brooks, *2d V.-Pres*. .. ...Pittsburgh, Pa
Joseph Wood, *Gen. Man*.. ....Pittsburgh, Pa
A. W. Sumner, *Pur. Agt*.......Columbus, O.
Geo. L. Potter, *Supt. M. P* ....Fort Wayne, Ind
(1) E'n Div.: 205m.
A. B. Starr, *Supt*...... ...Allegheny City.
W. F. Beardsley, *M. M*. Allegheny City, Pa.
Geo. P. Sweeley, *M. M*. .. . Crestline, O.
(2) W'n Div.: 304 m., C. D. Law, *Supt*. Ft. Wayne, Ind.
W. W. Atterbury, *M. M* ...Ft. Wayne, Ind.
J. A. Graham, *For. Car Rep*. Ft. Wayne, Ind.
(3) Erie & Ashtabula Div., 224 m.
H. W. Byers, *Supt*..... Lawrence Junc., Pa
G. J. Parkin, *M. M*.... ....Erie, Pa.
(4) Cleveland & Pittsb'g Div: 217 m.
L. F. Loree, *Supt*......... ... .Cleveland, O.
T. F. Butler, *M. M*............Wellsville, Ohio
(5) Toledo Div.: 126 m., W. H. Potter *Supt*. Toledo, O.
W. M. Lowe, *M. M* ....Toledo, O
Pennsylvania R. R. Co.'s Roads. (7 Gen. Divs.)
4-9 g. 4,045 m. 2,283 loco. 82,304 cars.
S. M. Prevost, *Gen. Man*.....Philadelphia, Pa
Samuel Porcher, *Ast. Pur. Agt*. Philadelphia, Pa
F. D. Casanave, *Gen. S. M. P*.......Altoona, Pa
(1) Pennsylvania R. R. Divs.
Frank L. Sheppard, *Gen. Supt* Altoona, Pa.
J. M. Wallis, *Supt. M. P*........Altoona, Pa.
G. W. Strattan, *M. M*.. . .... Altoona, Pa
Jno. P. Levan, *Gen. For. C. Shps*. Altoona, Pa
Phila. Div.: Tho. Gucker, *Supt*. ..W. Phila., Pa
A. D. Garrett, *M. M*.. .W. Philadelphia, Pa
I. W. Van Houten, *Gen. For. C.S* W. Phila., Pa
Schuylkill Div.:
W. H. Meyers, *Supt*..............Reading, Pa
Mid. Div.:
Geo. W. Creighton, *Supt*...Harrisburg, Pa.
E. L. Caum, *M. M*.... ....Harrisburg, Pa
W. F. Eberle, *Gen.....For. C.S*. Ha'burg, Pa
Altoona Div.: R E. Marshall, *Supt*. Altoona, Pa.
Pitts. Div.: Robert Pitcairn, *Supt*. Pittsburgh, Pa.
D. O. Shaver, *M. M*..........Pittsburgh, Pa.
W. Pa. Div.: D. M Watt, *Supt*...Allegheny City.
Wm. B. Norris, *M. M*..........Blairsville, Pa.
M. H. Fails, *Gen. For. C. S*....Blairsville, Pa.
Fred. Div.: A. W. Moss, *Supt*.........York, Pa
A. O. Baker, *M. M* ....Columbia, Pa.
Tyrone Div.: S. S. Blair, *Supt*........Tyrone, Pa.
J. A. Beamer, *M. M*...............Tyrone, Pa.
Lew. Div.:
Victor Wierman, *Supt*.....Lewistown, Pa.
Isaiah Paxson, *M. M*..... .Lewistown, Pa.
Bed. Div.: W. B. McCaleb, *Supt*..Bedford, Pa.
And. Green, *Fore. of Shop* ..State Line, Pa.
Monong. Div.: D. H. Lovell, *Supt*. Pittsburgh, Pa
Wm. Lininger, *Gen. Foreman* Pittsburgh, Pa
(2) United R. Rs. of N. J. Divs.:
F. Wolcott Jackson, *Gen. Supt*. Jersey City, N.J.
H. S. Hayward, *Supt. M. P*..Jersey City, N. J.
H. Canfield, *M. M* ...Hoboken, N. J.
N. Y. Div.: W. Bannard, *Supt*. Jersey City, N. J.
H. Canfield, *M. M*.. .. .. Hoboken, N. J.
J. W. Sanford, *M. M*.... ..Meadows, N. Y.
Belv. Div.: A. P. Gest, *Supt*. Lambertville, N.J
R. McDowell, *M. M*.......Lambertville, N. J
Amboy Div.: W. Brown, *Supt*.....Camden, N.J
Thos. Kerr, *M. M*....... ....So. Amboy, N. J
R. Hill, *M. M*.... ....Camden, N. J.
W. McAlister, *M. M*.... ....Camden, N. J
P. S. Bogart, *Gen. For*.....So. Amboy, N. J
(2½) Camden & Atlantic:
A. O. Dayton, *Supt*.. .... Camden, N. J.
(3) West Jersey R. R.
A. O. Dayton, *Gen. Supt*..........Camden, N. J
(4) Phila., Wilm. & Balt. R.R.
H. F. Kenney, *Gen. Supt*. ..Philadelphia, Pa.
Clarence Mendenhall, *S.M.P*. Philadelphia, Pa.
C. G. Turner, *M. M*...........Wilmington, Del.
(5) Phila. & Erie R. R. Divs.:
R. Neilson, *Gen. Supt*.... ...Williamsport, Pa.
Edw. D. Nelson, *Supt. Mo. Po*. Williamsport, Pa.
Northern Central Ry.
Robert Neilson, *Gen. Supt*...Williamsport, Pa
Edw. D. Nelson, *Supt. M. P*..Williamsport, Pa.
J. M. Coale, *M. M*...............Baltimore, Md.
G. W. Demarest, *Gen. For*.. Baltimore, Md.
Elm. & Can. Divs.: S. Meade, *Supt*..Elmira, N.Y.
Jas. Strode, *M. M*.... .. ..Elmira, N. Y.
J. C. Dyott, *Gen. For*...... ...Elmira, N. Y
Pensacola, Ala. & Tenn. Ry. 5 g. 26 m. 8 lo. 93 cars.
S. R. Dishman, *Pres. & P. A*. .Pensacola, Fla.
Peoria & Pekin Union Ry. 4-8½ g. 62 m. 20 lo. 350 c.
F. L. Tompkins, *Supt* ....Peoria, Ill.
F. C. Dodds, *Pur. Agt*.............Peoria, Ill.
Jas. W. Hill, *M. M. & M. C. B*..... Peoria, Ill.
Peoria, Decatur & Evansville Ry.
4-8½ g. 330m. 33 lo. 1,808 cars.
E. O. Hopkins, *Gen. Man*.....Evansville, Ind.
H. W. Matters, *Pur. Agt*........Princeton, Ind.
C. C. Robinson, *M. M. & M. C. B*. Mattoon, Ill.
Perkiomen Ry. 4-8½ g. 39 m. Locos. and cars leased from Reading R. R. Co.
H. Boyd, *P. A*................. .Norristown, Pa.
Philadelphia & Erie R. R. (*See Penna. R. R.; (5) Div.*)
Phila., Harrisb. & Pittsb. R. R. (*See Phila. & Read. R. R.*)
Philadelphia & Reading R. R.
4-8½ g. 1,193 m. 824 lo. 30,112 cars.
Theodore Voorhees, *Gen. M*..Philadelphia, Pa.
A. Foster, *Pur. Agt* .. ..Philadelphia, Pa.
L. B. Paxson, *Supt. M. P. & R. E*..Reading, Pa.
E. E. Davis, *A. S. M. P. & R. E*. Reading, Pa.
J. H. Rankin, *M. C. B*. ... . Reading, Pa.
I. A. Sweigard, *G. Supt*.... .Philadelphia, Pa.
Phila., Reading & New England.
4-8½ g. 181 m. 37 l. 607 cars.
Jas. K. O. Sherwood, *Rec*.. New York, N.Y.
C. M. Lawler, *G. M. & Pur. A*. Hartford, Conn.
E. M. Humstone, *M. M. & M. C. B*. Hartf'd, Conn.
Phila., Newtown & New York R. R. 4-8½ g. 23 m.
W. M. Geary, *Supt*............Philadelphia, Pa.
Howard Boyd, *Pur. Agt* ......Norristown, Pa.
Phila., Wilmington & Balt. R. R. (*See Penna. R. R.*
Piedmont Air Line (*See Rich. & Danville.*
Pine Bluff & Eastern Ry. 3 ft. g. 22 m. 2 lo. 20 c.
F. W. Fordyce, *Rec*...........St. Louis, Mo.
Pittsburgh, Akron & Western R. R.
(*See Northern Ohio Ry.*)
Pittsburgh, Brady's Bend & Lake Erie R. R.
Jos. Pool, *Pres*...............New York, N. Y.
Harwood R. Pool, *Sec'y*......New York, N.Y.
Executive Office, 62 Cedar St., New York, N.Y.
In course of construction.
Pitts. & Castle Shannon R. R. 3-4 g. 6½ m. 4 lo. 365 c.
E. J. Reamer, *Supt. & Pur. Agt*. Pittsburgh, Pa.
Holmes Ward, *M. M*......Castle Shannon, Pa.
W. E. Long, *M. C. B* .. ..Pittsburgh, Pa.
Pitts. & Lake Erie R. R. and lessees of Pitts., McK. & Yough R. R. 4-8½ g. 410.28 m. 103 lo. 5,526 c.
R. Evans, *Pur. Agt*. .... Pittsburgh, Pa.
L. H. Turner, *M. M. & M. C. B.*,
McKee's Rocks P. O., Pa.
Pitts. & West. Ry.: 3 & 4-8½ g. 353m. 119 lo. 5,435 c.
R. B. Campbell, *G. M*.........Baltimore, Md.
J. V. Patton, *Gen. Supt*....... Pittsburgh, Pa.
R. Finney, Jr., *Pur. Agt*...... Allegheny, Pa.
Thos. Anderson, *M. C. B*.......Allegheny, Pa.
H. O. Dunkle, *Supt. West. & Lake Div.*
Pittsburgh, Pa.
I. N. Kalbaugh, *M. M*......... Allegheny, Pa.
Pittsburgh, Chartiers & Youghiogheny Ry.
4-8¾ g. 17 m. 7 lo. 95 c.
J. B. Safford, *Supt. & Pur. Agt.*,
McKee's Rocks, Pa.
Pittsburgh, Bradford & Buffalo Ry. (*See Pitts. & West*
Pittsburgh, Cincinnati, Chicago & St. Louis Ry.
4-9 g. 1,473 m. 501 lo. 12,525 cars.
J. T. Brooks, *2d V. Pres*.......Pittsburgh, Pa.
Jos. Wood, *Gen. Man* ....Pittsburgh, Pa.
H. O. Hukill, *Pur. Agt* ...... Pittsburgh, Pa.
S. P. Bush, *Supt. M. P*........ .Columbus, O.
B. Fitzpatrick, *M. M*.............Columbus, O
John Cummerford, *For. C. S*....Columbus, O.
Pittsb. Div.: J. J. Turner, *Supt*. Pittsburgh, Pa.
W. C. Arp, *M. M*............. ..Dennison, O.
J. B. Swann, *For. C. S*............Dennison, O.
Ind. Div.: F. G. Darlington, *Supt*. Indianapolis, Ind.
Wm. Swanston, *M. M*.......Indianapolis, Ind.
P. H. McGraw, *For. C. S*....Indianapolis, Ind
Chic. Div.: C. H. Walbon, *Supt*. Logansport, Ind.
W. C. Pennock, *M. M*....... Logansport, Ind.
J. Hannon, *For. C. S*........Logansport, Ind.
Indianapolis & Vincennes R. R.
M. W. Mansfield, *Supt*......Indianapolis, Ind.
Jas. Landers, *Road For. Eng*. Indianapolis, Ind.
Pittsburgh, Ft. Wayne & Chicago Ry. (*See Penna. Co.*)
Pittsburgh, Marion & Chicago Ry. 4-8½ g. 25m. 3 l. 43c.
C. H. Smith, *Receiver*...... .. New Lisbon, O.
R. Beeson, *M. M. & M. C B*. New Galilee, Pa.
Pittsburgh, McK. & Yough. (*See P. & L. E.*
Pittsburgh, Shenango & Lake Erie Ry.
4-8½ g. 182 m. 30 lo. 1,985 c.
J. T. Blair, *G. Man*........ .....Greenville, Pa
W. G. Sargeant, *Pur. Agt*....... Meadville, Pa.
E. B. Gilbert......*M. M. & C. B*. Shenango, Pa.
Pittsburgh, Youngstown & Ashtabula (*See Penn. Co.*)
The Plant System, operating the Savannah, Florida & Western Ry.
4-9 g. 569 m. 92 lo. 2,228 cars.
Bradford Dunham, *G. Supt*....Savannah, Ga.
M. F. Loughman, *Pur. Agt*. New York, N.Y.
Wm. Rutherford, *Supt. M. P*..Savannah, Ga.
G. M. D. Riley, *M. M*.........Savannah, Ga.
T. M. McDonough, *M. M*..Thomasville, Ga.
South Florida R. R. Co. 4-9 g. 306 m. 32 lo. 663c.
H. A. Ford, *Supt*................Sanford, Fla.
A. B. Allen, *M. C. B* ....Sanford, Fla.
Charleston & Savannah Ry.
4-8½ g. 120 m. 23 lo. 751 cars.
C. S. Gadsden, *Supt*. ... Charleston, S. C.
M. F. Loughman, *Pur. Agt*. New York N.Y.
G. M. D. Riley, *M. M. & M. C. B*. Savannah, Ga.
Alabama Midland Ry.
4-8½ g. 208 m. 18 lo. 450 cars.
C. O. Parker, *Supt*. .. ..Montgomery, Ala.
T. M. McDonough, *M. M*..Montgomery, Ala.
Brunswick & Western.
4-9 g. 170 m. 23 lo. 591 cars.
G. W. Haines, *S. & P. A*. ... Waycross, Ga.
D. B. Overton, *M. M. & M. C. B*. Brunswick, Ga.
Silver Springs, Ocala & Gulf Ry.
4-8½ g. 80 m. 4 lo. 26 c.
J. W. Craig, *Supt*.... ... High Springs, Fla.
Pontiac, Oxford & Northern R. R.
4-8½ g. 100 m. 6 lo. 121 c.
Wm. C. Sanford, *Gen. Supt*.... Pontiac, Mich
W. C. Sanford, *Pur. Agt*..... ..Pontiac, Mich.
F. H. Neward, *M. M*......... ...Pontiac, Mich.
Pontiac Pacific Junc. Ry. 4-8½ g. 70 m. 4 lo. 62 cars.
W. D. Harris, *Man. Dir*........Ottawa, Ont.
H. L. Maltby, *P. A*........ ....Montreal, Can.
Jas. Kay, *M. M. & M. C. B*........Aylmer, Que.
Port Royal & Augusta Ry. 4-9g. 112 m. 15 lo. 142 c.
Jno. H. Averill, *Rec* ....Port Royal, S.C.
C. N. Averill, *Pur. Agt*......Port Royal, S. C.
Jno. S. Cook, *M. M*........ .. Augusta, Ga.
E. S. Schutz, *M. C. B*..... .. Augusta, Ga.
Port Royal & Western Carolina Ry.
4-9 g. 227 m. 14 lo. 120 cars.
John B. Cleveland, *Rec*. ... .Augusta, Ga.
J. W. Corner, *Pur. Agt*.... ...Savannah, Ga.
W. H. Stubb, *M. M*............ Augusta, Ga.
Portland & Rochester R. R. 4-8½ g. 55 m. 13 lo. 284 c
J. W. Peters, *Supt. & Pur Agt*...Portland, Me
E. H. C. Tompson, *M. M. & M. C. B*. Portland, Me
Portland & Rumford Falls Ry.
4-8½ g. 57 m. 6 l. 86 cars.
L. L. Lincoln, *S., G. M. & P. A*. Rumford Falls Me.
W. R. Davis, *M. M*......Rumford Falls, Me.
Port Jervis, Monticello & New York.
4-8¼ g. 42 m. 3 lo. 27 cars.
B. Ryall, *Rec. & Gen. Man*. Port Jervis, N. Y.
E. T. Haines, *Pur. Agt*....Port Jervis, N. Y.
A. Vanaken, *M. M*.......... Port Jervis, N. Y.
Port Townsend Southern R. R.
(*See Oregon Improvement Co.*)
Potomac, Fred.'g & Pied. R. R. 3 g. 38 m. 2 lo., 37
W. H. Richards, *G. M. & P. A*. Fred'cksburg, Va
W. P. Johnson, *M. M*. .....Fredericksburg, Va
Poughkeepsie & Eastern.
4-8½ g. 40 m. 3 l. 60 c.
E. C. Osborne, *Act G. M*..Poughkeepsie, N.Y.
Chas. H. Strong, *Supt. & M. M*,
Poughkeepsie, N. Y.
Powellton & Pocahontas R. R.
4-8½ g. 9 m. 2 lo. 36 cars.
E. Powell, *Pres*.. ....Powellton, W. Va.
A. T. Mussly, *Pur. Agt*....Powellton, W. Va.
W. T. Layton, *M. M*.......Powellton, W. Va.
W. S. Miller, *M. C. B*.....Powellton, W. Va
Prescott & Arizona Cent. Ry. 4-8½ g. 74 m. 3 l. 20c.
Wm. N. Kelly *Rec* .... Prescott, Ariz.
Tho. S. Bullock, *Pres. & G. Man*. New York, N.Y.
W. B. Jones, *G. S. & P. A* Prescott, Ariz.
E. Folliatt, *M. M*............ ..Prescott, Ariz.
Prince Edward Island Ry. (*See Intercolonial Ry*).
Profile & Franconia Notch R. R.
(*See Concord & Montreal R. R.*)
Prov. & Springfield R.R. Leased to N.Y. & N.E.R.R.
Pullman Palace Car Co. 2,573 passenger cars.
Geo M. Pullman, *Pres*............Chicago, Ill.
Horace Porter, *V. Pres*.......New York, N. Y.
T. H. Wickes, *2d V. Pres* .. ....Chicago, Ill.
Geo. F. Brown, *Gen. Man*.........Chicago, Ill.
Wm. A. Angell, *West'n Pur. Agt*..Chicago, Ill.
S. W. Bretzfield, *East'n Pur. A*..New York, N.Y
H. Middleton, *Manager* Pullman Works.
Pullman, Ill.
H. H. Sessions, *Chief Mech. Eng*. Chicago, Ill.

Q

Quebec & Lake S. John Ry. 4-8½ g. 280 m. 14 l. 314 c.
J. G. Scott, *Sec. & Manager* ....Quebec, Can.
A. Vallerand, *Pur. Agt*.... .....Quebec, P. Q.
Jno. Campbell, *M. M*............Quebec, P. Q.
Quebec Central Ry. 4-8½g. 158m. 12 lo. 406 cars.
Frank Grundy, *Gen. Man*...Sherbrooke, P. Q.
A. H. Anderson, *P. A*.......Sherbrooke, P. Q.
Jas. Seiveright, *M. M. & M. C. B*. Sherbrooke, P.Q.
Queen & Crescent Route.
4-8½ g. 1,158 m. 267 l. 10,460 c.
C., N. O. & T. P.: 4-8½ g. 336 m. 104 l. 3,947 c.
S. M. Felton, *Pres. & Rec*.... Cincinnati, O.
G. W. Stevens, *Supt. Car Service*,
Cincinnati, O.
J. P. McCuen, *Supt. M. P*.....Cincinnati, O.
A. Griggs, *Supt*......... ......Somerset, Ky.
I. W. Fowle, *M. M*...........Somerset, Ky.
P. H. Schreiber, *M. M*....Chattanooga, Tenn.
Eastern Ohio R. R.: 4-8½ g. 19 m. 2 lo. 205 cars.
W. H. Stevens, *Supt. & P. A*. Cumberland, O.
J. W. Gregg, *M. M*..... ......Cumberland, O.
Quincy, Omaha & Kan. City Ry. 4-8½g. 136m. 9 l. 142c.
J. M. Savin, *Gen. Man*........ ....Quincy Ill.,
C. E. Soule, *Supt. & Pur. Agt*....Quincy, Ill.
J. Voorhis, *M. M. & M. C. B*......Quincy, Ill.

R

Raritan River R. R. 4-8½ g. 11 m. 3 lo. 31 c.
Frank H. Earle, *Pres. & G. M*. Jersey City, N.J.
F. Hoffman, *Supt*........South Amboy, N. J.
C. H. Sisson, *P. A* ... .Jersey City, N J.
Raleigh & Western Ry. Co.
4-9 g. 92 m. 1 lo. 28 cars.
S. A. Henszey, *G. M. & P. A*...Egypt, N. C.
C. F. Pendleton, *Act. Supt*.... ..Egypt, N C.
Richmond & Danville R. R. Co.: (*See Southern Ry.*)
Richmond & Petersburg R.R (*See A. l. Coast Line.*)
Richmond, Fredericksburg & Potomac R. R.
4-8½ g. 86 m. 23 lo. 138 cars.
T. L. Courtney, *Supt. & Pur. A*. Richmond, Va.
J. T. Bryant *M. M*............. Richmond, Va.
Z. L. Trainham, *M. C. B*. ...Richmond, Va.
Richmond, Nicholasville, Irome & Beattyville Ry.
4-8½ g. 61 m. 4 lo. 28 cars.
John MacLead, *Rec*............Louisville, Ky.
W. H. Adams, *Supt*..... .... . Richmond, Ky.
K. MacLeod, *P. A*....... .....Louisville, Ky.
John Farrell, *Gen. Fore*......Richmond, Ky.
Rio Grande Western Ry.
4-8½ g. 531 m. 74 lo. 771 c.
D. C. Dodge, *Gen. Man*....... ...Denver, Colo.
Q. Lamplugh, *M. M. & M. C. B.*,
Salt Lake City, Utah
Rock Island & Peoria Ry. 4-8½ g. 118 m. 23 l. 570 c.
H. B. Sudlow, *Supt. & P. A*....Rock Island, Ill
Joseph Elder, *M. M. & M. C. B*......Peoria, Ill.
Rome, Watertown & Ogdensburg R. R. N. Y. C. & H. R. R. R. Lessee. 100 lo. 3,934 cars.
J. M. Toucey, *Gen. Man*.....New York, N. Y.
E. G. Russell, *Supt* ....Watertown, N. Y.
Allan Bourn, *Pur. Agt*..... .New York, N. Y.
Wm. Buchanan, *S. M. P. R. S*..New York, N.Y
P. T. Lonergan, *M. M*.........Oswego, N. Y.

S

Sabine & East Texas Ry. (*See So. Pac*
Saginaw, Tuscola & Huron R.R.
4-8½ g. 67 m. 9 l. 189 c.
Sanford Keeler, *G. M. & P. A.*, Saginaw, Mich.
Wm. L. Kerr, *Gen. For*....E. Saginaw, Mich.
Saginaw Valley & St. Louis R.R. (*Det. Lan. & North'n.*)
St. Augustine & South Beach Ry. 3 g. 5 m. 2 l. 2 c.
Allen Wood, *Gen. Man. & P. A.*,
St. Augustine, Fla.
W. J. Mack, *M. M*............Anastasia, Fla.
St. Johns & Lake Eustis Ry.
3 g. 52 m. 1 lo. 1 car.
C. P. Lovell, *Rec. & Gen. Man*. Leesburg, Fla.
P. L. McAteer, *Pur. Agt*. ....Leesburg, Fla.
D. B. Young, *M. M*..... .. ....Leesburg, Fla.
St. Johnsbury & Lake Champlain R. R.
4-8½ g. 132 m. 18 lo. 340 cars.
H. E. Folsom, *Supt*..... .....Lyndonville, Vt.
J. A. Farrington, *Pur. Agt*.....Boston, Mass.
Henry Bartlett, *Supt. M. P*....Boston, Mass.
J. T. Chamberlain, *M. C. B*......Boston, Mass.
St. Joseph & Grand Island R. R.
4-8½ g. 454 m. 35 lo. 1,450 cars.
W. P. Robinson, Jr., *Gen. Man*..St. Joseph, Mo
G. D. Berry, *Pur. Agt*..........St. Joseph, Mo.
A. C. Hinckley, *M. M*..... ....St. Joseph, Mo.
St. Louis, Cape Girardeau & Ft. Smith Ry.
4-8½ g. 104 m. 12 l. 120 cars.
E. S. McCarty, *Gen. Man*. Cape Girardeau, Mo.
Louis Houck, *Rec. & P. A*. Cape Girardeau, Mo.
A. W. Quackenbush, *Supt. of M. & M C. B.*
Cape Girardeau, Mo.
St. Louis & Hannibal. 4-8½ g. 104 m. 7 lo. 175 c.
J. A. Jordan, *Gen. Man. & P. A*..Hannibal, Mo.
Wm. P. Reidler, *M. M. & C. B*..Hannibal, Mo.
St. Louis & San Francisco Ry.
(*See A., T. & S. F. R. R.*)
St. Louis, Alton & Springfield R. R. (*See St. L., C. & St. P. Ry.*)
St. Louis, Alton & Terre Haute R.R.
4-8½ g. 240 m. 41 lo. 4,501c.
G. W. Parker, *Pres. & G. M*....St. Louis, Mo.
C. F. Parker, *Pur. Agt* .... .St. Louis, Mo.
J. W. Stokes, *M. M. & M. C. B.*,
E. St. Louis, Ill.
St. Louis, Chicago & St. P. R. R.
4-8½ g. 110 m. 13 lo. 2,857 cars.
I. W. Fowler, *Gen Supt*....... Springfield, Ill
W. E. Killen, *M. M. & M. C. B.*, Jerseyville, Ill.
St. Louis & Eastern.
4-8½ g. 50 m. (inc. S. L. & P.) 4 lo. 816 c,
Wm. E. Guy, *G. M. & P. A*....St Louis, Mo.
St. Louis Southwestern Ry. Co.
4-8½ g. 1,223 m. 136 lo. 4,465 cars.
J. A. Edson, *Supt*.............Texarkana, Ark.
A. Gould, *P. A*...................St. Louis, Mo
R. M. Gailbraith, *Gen. M. M*. Pine Bluff, Ark
St. Louis, Iron Mt. & So'n Ry. (*See Mo Pac.; (4) Div.*
St. Louis, Kan. City & Colorado R. R.
4-8½ g. 66 m. 2 l. 52 cars.
Adiel Sherwood, *Receiver*.....St. Louis, Mo.
W. M. Mitchell, *Man. Aud. & Treas.*,
St. Louis, Mo.
St. L., Keokuk & No.-W'n. Ry. (*See C., B. & Q.*)
St. Paul & Duluth R. R. 4-8½ g. 247 m. 62 lo. 2,499 c.
A. B. Plough, *Gen. Man*..... ...St. Paul, Minn.
W. N. Schoff, *Pur. Agt*..... ....St. Paul, Minn
G. D. Brooke, *M. M. & M. C. B*...St. Paul, Minn
Salisbury & Harvey Ry. 4-8½ m. 52 m. 2 lo. 35c.
A. Sherwood, *G. S. & P. A*....Hillsboro, N. B.
San Antonio & Aransas Pass Ry.
4-8½ g. 687.4 m. 60 lo. 1,485 cars.
M. D. Monserrate, *Gen. Man*. San Antonio, Tex.
T. B. Palfrey, *P. A*. .... San Antonio, Tex.
G. W. Butcher, *M. M*........San Antonio, Tex.
San Diego, Cuyamaca & Eastern Ry.
4-8½ g. 26 m. 2 lo. 39 cars.
W. S. Waterman, *G. M*.......San Diego, Cal.
Sandy River R. R. 2 g. 18 m. 4 lo. 35 cars.
Josiah Maxey, *G. M*.............Gardiner, Me.
P. H. Winslow, *Pur. Agt* ......Gardiner, Me.
E. Greenwood, *M. M*..............Phillips, Me.
Sandusky & Columbus Short Line.
(*See Col. S. & H. Ry. Co.*)
Sanford & St. Petersburg R.R. (*See Plant System.*
San Francisco & No. Pac. Ry.
4-8½ g. 165 m. 18 lo. 538 cars.
H. C. Whiting, *G. M. & P. A*. San Francisco, Cal
John Bonner, *M. M*...... ....Tiburon, Cal.
J. P. Samuelson *M. C. B*. .... ..Tiburon, Cal.
San Pete Valley R. R. 3 g. 51 m. 3 lo. 45 cars
T. Bruback, *Gen. Man*....Salt Lake City, U. T.
H. S. Kerr, *Supt. & P. A*...........Manti, Ut.
Wm. Watson, *M. M* ....Manti, Ut.
P. Wood, *M. C. B*..................Manti, Ut.
Santa Fe Southern Ry. 3 g. 40 m. 3 lo. 42 cars.
T. J. Helm, *Gen. Man*. ....Santa Fe, N. Mex.
Santa Fe, Prescott & Phœnix Ry. Co.
4-8½ g. 197.6 m. 10 lo. 91 cars.
F. M. Murphy, *Pres. & G. M*...Chicago, Ill.
O. H. Jackson, *M. M*..........Prescott, Ariz.
Sault Ste. Marie & Northwestern R. R. (*See Chi. St. P. Minn. & Omaha Ry.*)
4-8½ g. 28 m. 2 lo. 15 cars.
Savannah, Florida & W'n Ry. (*See Plant System.*.
Sav., Griffin & No. Ala. R. R. *Op. by Central (Ga.)*
Seaboard Air Line, operating
Seaboard & Roanoke, Roanoke & Tar River, Raleigh & Gaston, Raleigh & Augusta Air Line, Carolina Central, Durham & Northern and Georgia, Carolina & Northern Railroads.
Seaboard Air Line. 4-9 g. 927 m. 128 l. 2,215 c.
E. St. John, *V. P*....... .... Portsmouth, Va.
Jno. H. Winder, *Gen. Man*...Portsmouth, Va.
W. J. Edwards, *Pur. Agt*...Portsmouth, Va.
D. W. Ballantine, *M. C. B*....Portsmouth, Va.
Wm. T. Reed, *Supt. M. P. & M.*
Portsmouth, Va.
C. B. Royal, *M. M*.... .. .. .Portsmouth, Va.
Seaboard Ry. of Alabama. 3-6 g. 32¼ m. 5 lo. 48 c.
W. Best, *G. M*..............New York, N. Y.
Seattle, Lake Shore & Eastern Ry. (*See Northern Pacific Co.*)
Seattle & Northern Ry. (*See Ore. Improvem't Co.*)
Sharpsville R. R. 4-8¾ g. 23 m. 4 lo. 4 cars.
J. V. Patton, *P. & Gen. Man*.. ...Pittsburgh, Pa.
S. K. Harris, *Pur. Agt*........Sharpsville, Pa.
Jas. Glass, *M. M*......... ....Sharpsville, Pa.
Shepaug, Litchfield & Northern R. R.
4-8½ g. 38 m. 5 lo. 48 cars.
C. H. Pratt, *Gen. Man*....New Haven, Conn.
J. E. Martin, *Supt. & Pur. A*. Litchfield, Conn.
A. J. Broughel, *M. M. & M. C. B*. Hawleyville, Ct.
Sherman, Shreveport & Southern Ry.
4-8½ 153 m. 10 lo. 141 cars.
F. W. Fratt, *G. M*..... ......Greenville, Tex.
E. M. Alvord, *G. S. & P. A*. .Greenville, Tex.
Jas. Long, *M. M. & M. C. B*. Greenville, Tex.
Silver Lake Ry. Co. 4-8½ g. 7 m. 1 lo. 520 cars.
C. A. Carmichael, *Supt*...........Perry, N. Y.
John A. Dalziel, *Pur. Agt*...Rochester, N.Y.
Silver Springs, Ocala & Gulf R. R.
(*See Plant System.*)
Sioux City, O'Neill & Western Ry.
4-8½ g. 129 m. 6 lo. 355 cars.
F. C. Hills, *Rec., G. M. & Pur. Agt*.
Sioux City, Ia.
T. J. Roope, *M. M. & M. C. B*. Sioux City, Ia.
Sioux City & Northern R. R.
4-8½ g. 97 m. 12 l. 477 cars.
W. Hough, } *Receivers*.
S. J. Beals, }
G. W. Oakley, *Pur. Agt*.......Sioux City, Ia
T. Roope, *M. M*....... .... .Sioux City, Ia.
Sioux City & Pacific and 4-8½ g. 107 m. 11 lo. 370 c.
Fremont, Elkhorn & Mo. Val. R. R.
3 and 4-8½ g. 5,030$\frac{78}{100}$m. 1,010 l. 4,052 cars.
H. G. Burt, *Gen. Man*......... ..Omaha Neb.
C. H. Haywood, *Pur. Agt*.. ......Chicago, Ill.
S. A. Teal, *M. M*....... .. .Missouri Valley, Ia.
W. H. Ramseyer, *M. C. B*..Missouri Valley, Ia.
Skaneateles R. R. 4-8½ g. 5 m. 2 lo. 6 cars.
J. McNamara, *Man., Supt. & Pur. Agt.*
Skaneateles, N. Y.
M. Fennell, *M. M. & M. C. B*. Skaneateles, N. Y.
Somerset Ry. 4-8½ g. 42 m. 6 lo. 52 cars
W. M. Ayer, *Supt & Pur. Agt*......Oakland, Me
C. Crowell, *M. M*......... ......Oakland, Me
S. P. Mosher, *M. C. B*.... ...... .Oakland, Me
Sonora Ry. (*See A., T. & Santa Fe R. R.*)
South Atlantic & Ohio R. R. 4-9 g. 71 m. 10 l. 321 c.
John. C. Haskell, *Gen. Man. & Pur. Agt*.
Bristol, Va.
John R. King, *M. M*................Bristol, Va.
South Carolina & Georgia R. R.
4-8½ g. 270 m. 45 lo. 1,321 cars.
E. S. Bowers, *Gen. Man*.. ....Charleston, S.C.
Ed. Parsons, *Pur. Agt*.......Charleston, S. C.
James Meehan, *M. M. & M. C. B*. Charleston, S. C.
Southern California Ry. (*See A., T. & S. F. Ry.*)
Southern Pacific Company and proprietary lines:
4-8½ and 3 ft. g. 144.20 m. 3 ft., 6,496.80 4-8½ 962 lo. 25,051 cars.
J. Kruttschnitt, *Gen. Man.*,
San Francisco, Cal.
R. P. Schwerin, *Pur. Agt*....San Francisco, Cal.
W. G. Van Vleck, *Man.*, Atlantic System,
Houston, Tex.
J. J. Ryan, *Supt. M. P*........Houston, Tex.
Benj. Welch, *M. C. B*..........Sacramento, Cal.
Pacific System
J. A. Fillmore, *Man*......San Francisco, Cal.
Henry J. Small, *Supt. M. P. & M.*
San Francisco, Cal.
Western Div.:
Supt........Oakland Pier, Cal.
Wm. McKenzie, *M. M*. ....Oakland Cal
W. B. Ludlow, *M. C. B*.... ....Oakland, Cal.
R. E. French, *M. M*. ... .Bakersfield, Cal.
Sacramento Div.: J. B. Wright, *Supt*. Sa'mento, Cal.
T. W. Heintzleman, *M. M*..Sacramento, Cal.
Salt Lake Div. J. Alger, *Supt*....Ogden, Utah.
E. M. Luckett, *Act. M. M* . .Terrace, Utah.
Coast Div.:
J. L. Frazer, *Supt*....... San Francisco, Cal.
P. Sheedy, *M. M. & M. C. B*. San Francisco, Cal.
Stockton Div:
W. W. Prugh, *Supt*...... ....Lodi, Cal.
M. J. Crosby, *M. M*.......Stockton Wharf, Cal.
Yuma Div.:
E. P. Randolph, *Supt*.. . Tucson, Ariz.
Geo. Gregg, *M. M*.. ....Los Angeles, Cal
Tucson Div.:
E. P. Randolph, *Supt*.........Tucson, Ariz
R. W. Gray, *M. M*.. ....Tucson, Ariz.
Shasta Div.: J. H. Noble, *Supt*..Dunsmuir, Cal.
A. D. Kilborn, *M. M*..........Dunsmuir, Cal.
Oregon and Sacramento Div.:
L. R. Fields, *Supt*..... ....Portland, Ore.
T. W. Younger, *M. M*........Portland, Ore.
Southern Ry. Co.
4 ft. 9 in. g. and 3 ft. 4,489 m. 625 lo. 20,099 c.
W. W. Finley, *3d V.-Pres*.....Wash'ton, D.C.
W. H. Green, *Gen. Supt*....Washington, D. C.
J. P. Minetree, *Pur. Agt*.... Washington, D. C.
R. D. Wade, *Supt. M. P*......Washington, D.C.
W. H. Thomas, *Asst. Supt. M. P*. Wash'ton, D.C.
J. H. Simpson, *Supt. Car Service*
Washington, D. C.
First Division:
N. J. O'Brien, *Supt*.... ....Danville, Va.
W. H. Owens, *M. M*..... . Manchester Va.
C. F. Thomas, *M. M*........ Alexandria, Va.
Second Division:
W. B. Ryder, *Supt* ... .Charlotte, N. C.

C. W. Lee. *M. M.*.....Salisbury, N. C.
W. A. Walden, *M. M.*.....Atlanta, Ga.
Third Division:
Paul I. Welles, *Supt.*.....Columbia, S. C
J. H. Green, *M. M.*.....Columbia, S. C.
Fourth Division:
F. K. Huger, *Supt.*.....Knoxville, Tenn.
J. B. Michael, *M. M.*.....Knoxville, Tenn.
Fifth Division:
W. R. Beauprie, *Supt.*.....Atlanta, Ga.
W. H. Hudson, *M. M.*.....Atlanta, Ga.
Sixth Division:
J. N. Ross, *Supt.*.....Birmingham, Ala.
W. L. Tracy, *M. M.*.....Birmingham, Ala.
W. A. Stone, *M. M.*.....Selma, Ala.
Seventh Division (Southern Ry. in Ky.)
G. R. Loyall, *Supt*.....Louisville, Ky.
V. B. Lang. *M. M*.....Louisville, Ky.
Supplemental to Southern Ry., Alabama Great Southern Ry. 4-8½ g. 295 m. 59 lo. 3,611 cars.
A. J. Frazer, *Supt.*.....Birmingham, Ala.
C. Skinner, *M. M.*.....Birmingham, Ala.
Southwestern Ry. 3 g. 35 m. 4 lo. 55 cars.
L. E. Barker, *S.&P.A.*GreenCove Springs, Fla.
J. F. Lowe, *M. M.*.Green Cove Springs, Fla.
South Florida R. R. (*See Plant System.*)
South Jersey R. R. 4-8½ g. 67 m. 8 lo. 38 cars.
Francis I. Gowen, *Receiver*..Cape May, N. J.
Henry Wood. *Man*.....Cape May, N. J.
C. T. Kensil, *P. A*.....Philadelphia, Pa
Spokane Falls & Northern Ry. Co
-8½ g. 200 m. 8 lo. 304 cars.
D. C. Corbin, *Pres. & G. M.*..Spokane, Wash.
O. D. Mott, *Pur. Agt*.....Spokane, Wash.
C. H. Prescott, *M. M. & C. B.*.Spokane, Wash.
Staten Island Rapid Transit R.R.
4-8½ g. 30 m. 18 l. 103 cars.
Frank S. Gannon, *Gen. Man*.....New York
W. H. Lewis, *Pur. Agt*.....New York.
Thos. Tyrrell, *M. M*.....Clifton, S. I.
Stewartstown R.R. 4-8¾ g. 7 m. 1 lo. 3 cars.
M. W. Bahn, *Gen. Man*....Stewartstown, Pa.
W. H. Fulton, *G.S.&P.A.* .Stewartstown, Pa.
J. B. Kennedy, *M. M.*.....Stewartstown, Pa.
Stony Clove & Catskill Mountain R. R. (*See Ulster & Delaware*).
3 g. 14 m. 2 lo. 19 cars.
Stuttgart & Arkansas River Ry.
4-8½ g. 41 m. 2 lo. 4 cars.
S. W. Fordyce, *Rec.*.....St. Louis, Mo.
Suffolk & Carolina Ry. 3-6 g. 40 m. 4 lo. 107 cars.
J. H. Macleary, *G. Man., Pur. A., Supt. & M. M.* Suffolk, Va.
Sumter Valley Ry.
3 g. 25 m. 4 lo. 70 cars.
David Eccles. *Gen. Man*.....Baker City. Ore.
J. A. West. *Supt. & P. A*.... Baker City, Ore.
F. W. Shurtliff, *M. M.& M.C. B.*Baker City, Ore.
Syracuse, Geneva & Corning. (*See Fall B. Coal Co*).

T

Tennessee Midland Ry.: 4-8½ g. 135 m. 7 lo. 187 c (*See Paducah, Tenn. & Ala.*)
Terminal R. R. Association.
4-8½ g. 44 m. 28 lo. 39 cars.
Jas. Ramsey, Jr., *Gen. Man*...St. Louis. Mo.
H. M. Smith, *M. M*.....St. Louis, Mo.
J. E. Williams, *P. A*.....St. Louis, Mo.
Terre Haute & Indianapolis R. R.
Vandalia Line.
4-9 g. 634 m. 139 lo. 6,000 cars.
J. G. Williams, *Gen. Man*..Terre Haute, Ind.
C. R. Peddle, *Pur. Agt*...Terre Haute, Ind.
Geo. H. Prescott. *S.M.P.*.....Terre Haute, Ind.
F. C. Cleara, *M. M*.....Terre Haute, Ind.
C. Butler, *M. M*.....Effingham, Ill.
Texarkana & Ft. Smith Ry.:
4-8½ g. 68 m. 5 lo. 91 cars.
W. A. Williams, *Gen. Man. & Pur. Agt.* Texarkana, Tex.
A. A. Campbell, *M. M*.....Texarkana, Tex.
J. T. Romack, *M. C. B*.....Texarkana, Tex.
Texas Central Ry. 4-8½ g. 187 m. 10 l. 237 cars
C. Hamilton, *Gen. M. & P. A*.....Waco, Tex.
F. H. Dehn, *M. M*.....Walnut Springs, Tex.
P. T. Mooney, *M. C. B.*.Walnut Springs. Tex.
Texas Midland Ry. 4-8½ g. 75 m. 6 lo. 181 c.
E. H. R. Green, *G. M.& Pur. A.*. Terrell, Tex.
B. Hanson, *M. M.*.....Terrell, Tex.
Texas & N. Orleans R. R. (*See So. Pac.*)
Texas & Pacific R.R. 4-8½ g. 1,499 m. 194 l. 4,554 c.
L. S. Thorne, *Gen. Man*.....Dallas, Tex.
A. Gould, *Pur. Agt*.....St. Louis, Mo
J. W. Addis, *S. M. P.*.....Marshall, Tex.
W. D. Minton. *M. C. B.*.....Marshall, Tex.
Texas, Sabine Valley & Northwestern Ry.
4-8½ g. 40 m. 3 lo. 28 cars.
R. J. Evans, *G. M..G.S. & P.A*.Longview, Tex.
T. M. Berry. *M. M.& M. C. B.*..Longview, Tex
Texas Trunk R. R. 4-8½ g. 51 m. 2 lo. 67 cars.
G. T. Atkins, *Rec*.....Dallas, Tex.
Wm. Whyte, *Supt. & Pur. Agt* Dallas, Tex.
C. H. Burns, *M. M*.....Houston, Tex.
Jas McGee, *M. C. B*.....Houston, Tex.
Tionesta Valley R. R 3 g. 62 m, 5 l, 272 c.
Isaac Horton, *Gen, Man*.....Sheffield, Pa
Jerry Crary, *G. S., M. M. & M. C. B.*.. Sheffield, Pa.
A. H. Bailey, *Pur. Agt*.....Sheffield, Pa.
Toledo, Ann Ar. & No. Mich. Ry. (*See Ann. Arbor R.R.*).
Toledo & Ohio Central Ry. (*See Ohio Cent. Lines.*

Toledo, Peoria & Western Ry.
4-8½ g. 248 m. 39 l. 881 c.
Ed. F. Leonard. *Gen. Man*.....Peoria, Il.
B. Warren, *Pur. Agt. M. M. & M. C. B.* Peoria, Ill.
Toledo, St. Louis & Kan. City R. R.
4-8½ g. 451 m. 87 lo. 3,697 c.
R. B. F. Pierce. *Rec*.....Indianapolis, Ind.
A. L. Mills, *Pur. Agt. & Supt*.....Toledo. O.
Frank J. Pease, *S. M. P*.....Frankfort, Ind.
J. Tenfer, *M. C. B*.....Frankfort, Ind.
Tuckerton R. R. 4-9 g. 29 m. 3 lo. 23 car.
John C. Price. *Supt*.....Tuckerton. N. J.
Richard Ashhurst, *Pur. Agt.*Philadelphia, Pa.

U

Ulster & Delaware R. R.
87 m. 4-8½ g. 23 m, 3 ft. g. 22 lo. 310 cars.
Edward Coykendall, *G. Supt. & P. A.*, Rondout, N. Y.
A. W. Belcher, *M. M*.....Rondout, N. Y.
John H. Decker. *M. C. B*.....Rondout, N. Y.
Union Pacific Ry. (4 Gen. Divs.)
4-8½ g. 4,400.3 m. } 705 lo. 17,376 cars.
3 g 397 m. }
S. H. H. Clark, Oliver W. Mink, E. I. Ellery Anderson, John W. Doane, Fred. R. Coudert, *Receivers*.....Omaha, Neb.
E. Dickinson, *Gen. Man*.....Omaha, Neb.
J. W. Griffith, *Pur. Agt*.....Omaha, Neb.
J. H. McConnell. *Supt. M. P.*.....Omaha. Neb
A. M. Collett, *Gen. Fore. Car. Dept.* Omaha, Neb.
Neb. Div.:
P. J. Nichols, *Gen. Supt*.....Omaha, Neb
J. H. Manning, *M. M*.....Omaha, Neb.
A. M. Collett, *Gen. Car For*.....Omaha, Neb
Wyo. Div.
T. A. Davies, *M. M*.....Laramie, Wyo.
Utah Div.:
J. H. Young, *Supt.*.....Salt Lake City. Utah.
J. F. Dunn, *M. M*.....Pocatello, Idaho.
Col. Div.: W. A. Deuel, *Gen. Supt.*.Denver, Col.
J. P. Bay, *M. M*.....—Denver, Col.
J. W. Blackburn, *For. Car Reps.*, Denver, Col.
Idaho Div.: C. A. Boies, *Supt*.....Pocatello, Id.
.....Pocatello, Id
Kan. Div.: J.O. Brinkerhoff, *Supt.* Kan. City, Mo
F. Mertsheimer, *M. M.*.....Armstrong, Kan
Union Pacific, Denver & Gulf Ry.
4-8½ and 3 ft. g 971 m, 92 lo, 3,109 cars.
Frank Trumbull, *Rec. & Gen Man.*, Denver, Colo.
T. F. Dunaway, *Gen. Supt. & Pur. Agt.* Denver, Colo.
M, F. Egan, *M. M*.....Denver, Colo.
Union Tank Line Co. 6.600 cars.
J. Howard Wright, *Pur. Agt*, New York, N. Y.
C. A. Smith, *M. C. B*.....New York, N.Y
Utah Central Ry.
3 g. 64 m. 7 lo. 158 cars.
J. McGregor. *G.M.&P.A.*Salt Lake City. Utah.
J. G. Bywater. *M.M&M.C.B.*S. L. City, Utah.

V

Vermont Valley. (*See Boston & Maine.*)
Vicksburg & Meridian R.R. (*See Queen & Crescent.*)
Virginia & Truckee R. R. 4-8½ g. 52 m. 14 lo. 325 c.
Hume Yerington, *G. M.& P. A.* Carson City, Nev.
I. N. Fording, *M M*.....Carson City, Nev.
C. Brulein. *M. C. B*.....Carson City, Nev.
Virginia Midland Ry. (*See Southern Ry. Co.*)

W

Wabash R.R. 4-8½ g. 1,979 m. 418 l. 13,291 c
Chas. M. Hays, *Gen. Man*.....St. Louis, Mo.
J. B. Barnes, *Supt. M. P. & M.*Springfield, Ill.
M. M. Martin, *Supt. C. D*.....Decatur, Ill.
H. H. Wellman, *Pur. Agt*.....St. Louis, Mo.
Wabash, Chester & Western R.R.
4-8½ g. 65 m. 4 l. 102 c.
C. B. Cole, *Gen. Man*.....Chester, Ill.
J. R. Hawkins, *Gen. Supt & P. Agt.*Chester, Ill.
Waco & Northwestern Ry.
4-8½ g. 54 m. 6 lo. 91 cars.
P. A. Gorman, *G. M. & P. A*.....Waco, Tex.
Alfred Abeel, *Rec*.....Waco, Tex.
Wagner Palace Car Co.
W. S. Webb, *Pres*.....New York, N. Y.
J. D. Taylor, *Treas*.....New York, N. Y
E. A. Benson, *Manager Buff. Wks.*, Buffalo, N. Y.
Wallkill Valley. 4-8½ g. 38 m. 3 l. 17 c
J. D. Layng, *Gen. Man*.....New York, N.Y.
A. Bourn, *Pur. Agt*.....New York
Wm. Buchanan, *Supt. M. P*.....New York
J. M. Boon, *Asst. S.M.P.*.....Frankfort, N.Y
Washington & Columbia River Ry. Co.
4-8½ g. 162 m. 7 lo. 67 cars
W. D. Tyler, *Pres., Gen. Man. & Pur. Agt.*, Walla-Walla, Wash.
J. Winslow, *S. M. P*....Walla-Walla, Wash.
Washington Southern Ry. Co. 4-8½g. 75m. 3 l. 118c.
J. R. McDonald, *G. M. & S*....Seattle, Wash
A. Johnson, *Pur. Agt*.....Shelton, Wash.
M. M.& M.C. B...Shelton, Wash.
Waynesburg & Washington R.R. 3g. 29 m. 4 l. 53 c
C. E. Bower, *Supt*.....Waynesburg, Pa
H. O. Hukill, *Purch. Agt*.....Pittsburgh, Pa
A. M. Kline. *M. M*.....Waynesburg, Pa
Waycross Air Line R.R. Co. 4-8½ g. 30½m. 3 lo. 10c.
L. Johnson, *Gen. Supt. & Pur. Agt.* Waycross, Ga.
Western & Atlantic R. R. (*See Nashville, Chatt. & St. Louis Ry. Co.*)

Western Maryland R. R. 4-8½ g. 222 m. 50 lo. 856 c.
J. M. Hood, *Pr. & Gen. Man*...Baltimore, Md
H. M. Burgand, *Pur. Agt*.....Baltimore, Md.
David Holtz, *Mast. of Mach.*.Union Bridge, Md
D. E. Little, *M. C. B*.....Union Bridge, Md.
Balt. & Har'sb'g Div.: H. D. Scott, *Spt.*.Hanover, Pa.
H. S. Reiley, *M. M*.....Hanover Pa.
Western New York & Pennsylvania R.R.
4-8½ and 3 g .635 m. 150 l. 8,233 c.
S. G. De Coursey, *Receiver*.....Buffalo. N. Y.
Robert Bell, *Gen. Supt*.....Buffalo, N.Y.
J. H. Poole, *Pur Agt*.....Buffalo, N. Y.
Allen Vail, *Gen. M. M*.....Buffalo. N. Y.
Pitts. Div.: J. P. Heiadell, *Supt*.....Oil City, Pa.
P. P. Foller, *M. M*.....Oil City, Pa.
Roch. Div.: J. W. Watson, *Supt*.....Olean, N. Y
John Magee, *M. M*.....Olean, N. Y.
West Jersey R. R. (*See Penn. R. R.*; (3) *Div.*
West Shore R. R. (N. Y. C. & H. R. R. R. Lessee.
4-8½ g. 489 m. 220 lo. 8,118 c.
J. D. Layng, *Gen. Man*.....New York, N. Y.
A. Bourn, *Pur. Agt*.....New York, N. Y.
W. Buchanan, *Supt. M. P. & R. S.* New York, N.Y.
Jas. M. Boon, *Asst. S. M. P. & R. S.* Frankfort, N.Y.
H. R. Div.: W. G. Wattson, *Supt.*..Weehawken, N. J.
J. Howard, *M. M*.....New Durham, N. J.
Buff. Div.: C. H. Ketcham, *Supt*..Syracuse, N. Y.
P. E. Garrison, *M. M*.....E. Buffalo, N. Y.
W. Va. Cent. & Pittsb'gh Ry. 4-8½ g. 150m. 29 lo. 1,806 c.
C. L. Bretz, *Gen. Man*.....Cumberland, Md.
W. H. Bower, *Asst. Gen. Man. & Pur. Agt.* Cumberland, Md.
J. S. Turner, *Supt. M. P*.....Elkins, W. Va.
W. Va. & Pittsburgh R. R. 4-8½ g. 160 m. 18 lo. 555 c.
A. H. Kunst, *G. Man. & Pur. A*..Weston, W. Va.
S. A. Steele, *M. M*.....Weston, W. Va.
White & Black River Valley Ry. 4-8½ g. 64 m. 41. 96 c.
W. J. Thompson, *Gen. Man. & P. A.*, Little Rock, Ark.
W. J. Redding, *M. M*.....Brinkley, Ark.
L. F. Hill, *M. C. B*.....Brinkley, Ark.
Wheeling & L. E. Ry. 4-8½ g 249 m. 70 lo. 5,103 c
A. G. Blair, *G. M*.....Toledo, O.
F. S. Deal, *P. A*.....Toledo, O.
W. H. Stark, *M. C. B*.....Toledo, O.
O. P. Dunbar, *M. M*.....Norwalk. O.
Wichita & Western Ry. (Operated by A.T.&S.F. Ry.)
The Wiggins Ferry Co.; East St. Louis Connecting Ry.; St. Louis Transfer Ry.
4-8½ g. 47 m. 14 lo. 30 cars.
G. L. Sands, *Man*.....St. Louis, Mo.
C. L. Leslie, *Pur. Agt*.....St. Louis, Mo.
R. H. Johnson, *M. M. & M. C. B.* E. St. Louis, Mo.
Williamsport & North Br. R.R. 4-9 g. 44.4 m. 7 l. 11 c.
R. E. Eavenson, *Gen. Man. & Pur. Agt.* Hughesville, Pa.
Geo. Woodley, *M. M*.....Hughesville. Pa.
Wilmington & No'n R. R. 4-8¾ g. 90 m. 28 lo. 463 c.
A. G. McCausland, *S. & Pur. A.* Wilmington, Del.
George Rommel, *M. M*.....Wilmington, Del.
Wilmington, Newbern & Norfolk Ry.
4-9 g. 88 m. 4 lo. 74 cars.
H. A. Whiting. *Gen. Man*. Wilmington, N. C.
A. J. Howell, Jr. *Pur. Agt*. Wilmington, N. C.
Geo. E. Branch, *M. M*.....Wilmington, N. C.
Windsor & Annapolis Ry. (*See Dominion Atl Ry*)
Winifrede R. R. 4-9 g. 10 m. 3 lo. 209 cars.
R. B. Cassady, *Gen. Supt*... Winifrede, W. Va.
H. W. Leitch, *Pur. Agt*... Winifrede, W. Va.
C. P. Spofford, *M. M*.....Winifrede, W. Va.
J. A. Bratt, *M. C. B*.....Winifrede, W. Va.
Winona & Western Ry.
4-8½ g. 117 m. 7 l. 344 cars.
J. J. Mahoney, *G. Supt. & P. A.* Winona, Minn.
John Mailar, *M. M. & M. C. B.* Winona, Minn.
Wisconsin Central Co.
4-8½ g. 939.88 m. 149 lo. 7,030 c.
H. F. Whitcomb. *Gen. Man*. Milwaukee, Wis.
Sumner J. Collins, *Gen. Supt.* Milwaukee, Wis.
J. A. Whaling, *Pur. Agt*.....Milwaukee, Wis.
Jas. McNaughton, *Supt. M. P.* Waukesha, Wis.
Wm. Cormack, *M. C. B.* Stevens Point, Wis.
Wisconsin & Michigan Ry. 4-8½ g. 64 m. 7 lo. 329 c.
J. N. Faithorn, *Gen. Man. & Pur. Agt.* Chicago, Ill.
Wood River Branch Ry. 4-8½g. 6. m. 2 lo. 3 cars.
L. M. Barber, *S., P. A. & M. M.* Hope Val., R. I.
Wrightville & Tennille Ry. 4-9 g. 36 m. 3 lo. 26 c.
G. W. Perkins, *G. M., Supt. & P. A.*. Tennille, Ga.
W. H. Shepherd, *M. M. & M. C. B.* Tennille, Ga.

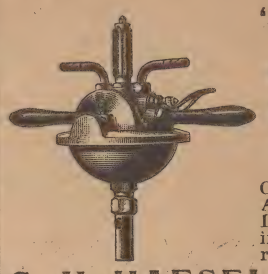
Y

Yarmouth & Annapolis. (*See Dominion Atl. Ry.*)
York Southern R. R.
36 m. 4-8½ g. 5 m. 3 ft. g. 41 m. 3 lo. 30 cars.
S. M. Manifold, *G. M. & Pur. Agt*..York, Pa.
G. M. Jacobs, *M. M*.....York, Pa.
Yougiogheny R. R. 4-8½ g. 10 m. 2 lo. 1,205 cars.
John F. Wolf, *Gen. Man. & Gen. Supt.* Irwin, Pa.
T. F. Wolf, *P. A*.....Irwin, Pa.
Jno. Bricker, *M. M*.....Irwin, Pa.
J. W. Heintzelman. *M. C. B*.....Irwin, Pa.
John Rhoads. *Supt. Car Dept.* Philadelphia, Pa

Z

Zanesville & Ohio River Ry. 4-8½ g. 75 m. 7 lo. 199 c.
J. H. Sutor, *Rec. & Gen. Man*..Zanesville, O.
J. Hope Sutor, *Pur. Agt*.....Zanesville, O.
*M. M.& M. C. B.*Zanesville, O.

Investigate



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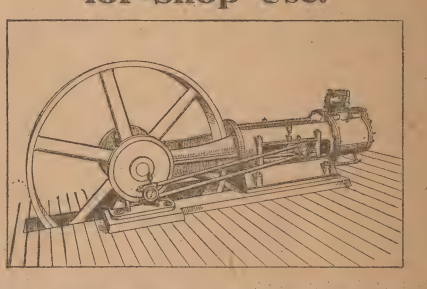

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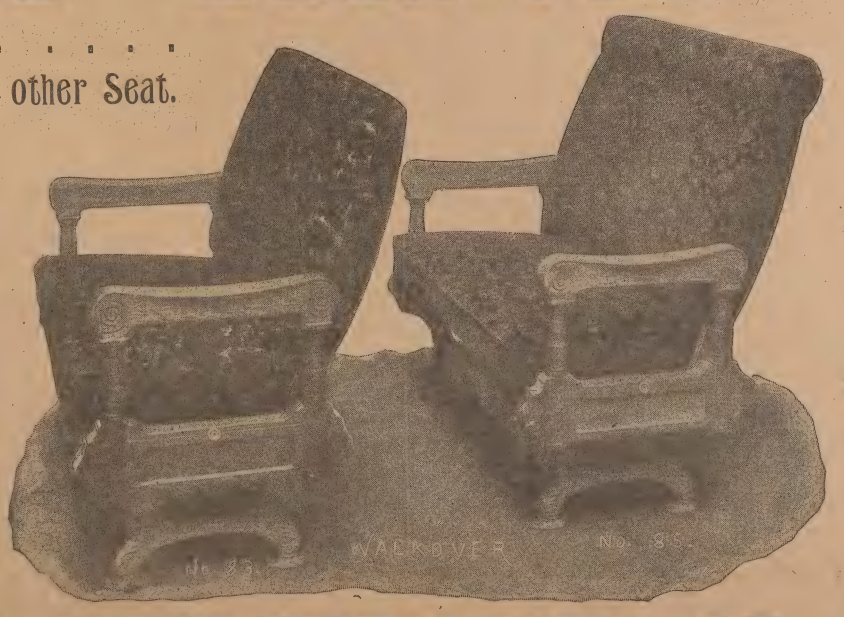

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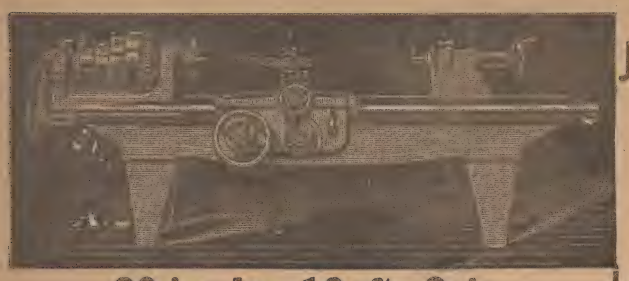

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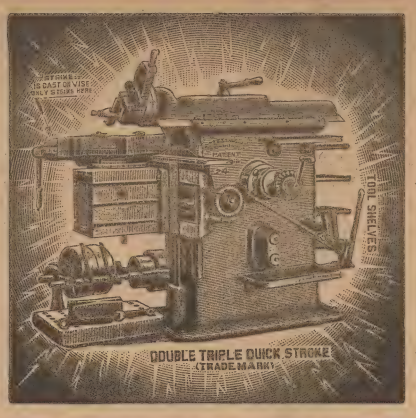

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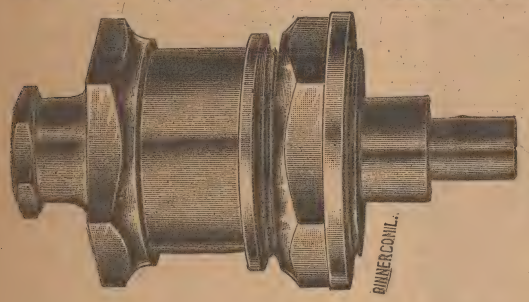

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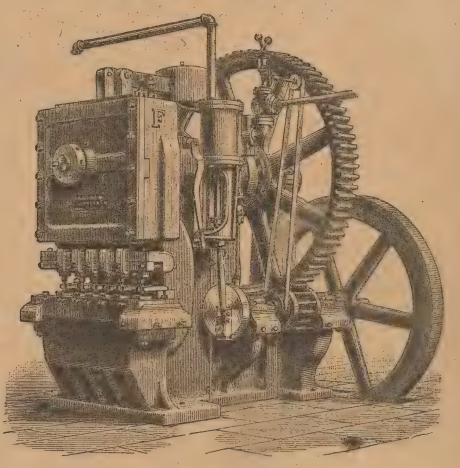

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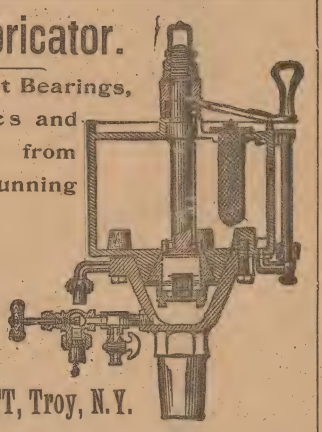

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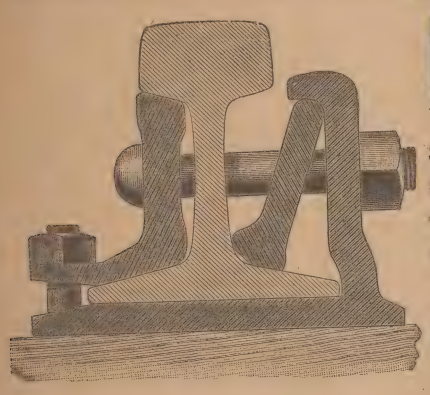

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